DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

HEARINGS

BEFORE THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

NINETY-SEVENTH CONGRESS

SECOND SESSION

ON

S. 2248

AUTHORIZING APPROPRIATIONS FOR FISCAL YEAR 1983 FOR PROCUREMENT, FOR RESEARCH, DEVELOPMENT, TEST, AND EVALUATION, AND FOR OPERATION AND MAINTENANCE FOR THE ARMED FORCES, TO PRESCRIBE PERSONNEL STRENGTHS FOR THE ARMED FORCES AND FOR CIVILIAN PERSONNEL OF THE DEPARTMENT OF DEFENSE, AND FOR OTHER PURPOSES

PART 4—TACTICAL WARFARE

FEBRUARY 4; MARCH 3, 4, 5, 9, 11, 16, 17, 26, 1982

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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

THURSDAY, FEBRUARY 4, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

AH-64 ATTACK HELICOPTER PROGRAM

The subcommittee met in open session, at 9 a.m., pursuant to notice, in room 224, Russell Senate Office Building, Senator Barry Goldwater (chairman) presiding.

Present: Senators Goldwater, Tower, Thurmond, Warner, Jepsen, Cannon, and Byrd of Virginia.

Staff present: Rhett B. Dawson, staff director and chief counsel; James F. McGovern, general counsel; Paul C. Besozzi, minority counsel; Christine E. Cowart, chief clerk; L. Wayne Arny III, Michael B. Donley, Robert S. Dotson, George K. Johnson, Jr., José E. Martinez, Patrick L. Renehan, Carl M. Smith, professional staff members; Drew A. Harker, and Mark B. Robinson, research assistants; and Tamara L. Jones, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Buzz Hefti, assistant to Senator Warner; Jim Dykstra, assistant to Senator Cohen; Jon Etherton, assistant to Senator Jepsen; Don Ingram, assistant to Senator Quayle; Frank Krebs, assistant to Senator Cannon; and Gray Armistead, assistant to Senator Byrd.

OPENING STATEMENT BY SENATOR BARRY GOLDWATER, CHAIRMAN

Senator GOLDWATER. The meeting will come to order.

Good morning, ladies and gentlemen.

This is an open hearing and you are all welcome. It is my intention to keep this hearing open as long as possible; however, since we must eventually discuss matters which are either classified or proprietary, I expect to go into closed session for a brief period before we adjourn. At that time I will ask that those who do not have the required clearances excuse themselves from the room.

I might apologize at this time if I have to leave a little early. I have to be in court in New York at 2 p.m. for an important matter.

This hearing has been called in response to reports of major cost growth in the army's AH-64 attack helicopter program.

In mid-December the committee learned that what had been a $6 billion program for 536 helicopters was now a $7 billion program

and, making matters worse, that $7 billion would buy just 446 helicopters, 90 fewer than originally planned. The increase in unit cost of the helicopter, if you subtract the already expended R. & D. funds of $1.2 billion, is an incredible 45 percent.

I was shocked when I first learned of this dramatic increase and I am still in a state of shock. By the time this hearing adjourns I expect the Army to have explained to the satisfaction of this committee: First, what caused this cost growth; second, why the Army and the contractor failed to foresee it; third, why the Army waited so long to notify Congress of the problem; and fourth, what cost-reducing steps the Army intends to take if they still wish to procure this helicopter.

Before we begin, I want to make it clear that the cost management problems apparent today in the AH-64 are not to be found in all of our major weapon programs. There are others that are having problems and they will be examined in turn; but, in general, we are doing considerably better in managing our defense dollars today than we were 2 years ago.

Congressional insistence on higher, more economical production rates and such innovative efforts as multi-year contracting proposed by the Secretary of Defense are all aimed at controlling the rising cost of military hardware. These measures have already produced significant cost reductions and should continue to increase the return on our defense dollars.

The Army is also entitled to recognition for some of its recent efforts to hold the lid on costs. I have received a copy of a report from the Army's ad hoc Cost Discipline Advisory Committee and vigorously support many of its recommendations. I hope that the collective wisdom of that distinguished panel will not be ignored.

But our purpose today is far removed from celebrating the success of any cost reduction initiatives. We are here instead to get to the bottom of a matter which may have long-reaching implications for the Army's overall modernization effort. I am certainly not the first to recognize that given a finite limit on spending authority, unconstrained cost growth in one program represents a threat to the funding of all other programs.

The Reagan administration is clearly committed to strengthening our national defense posture and we are fortunate that, so far, the Congress and the American people have supported this effort, but let me reemphasize—and I have said this repeatedly—we are not going to waste the taxpayers' dollars in the process.

I have flown the AH-64 and believe it to be a very fine helicopter. As with any new aircraft, there are bugs to be worked out, but I am nevertheless persuaded that it could provide our Army with a capability that it very much needs. However, I do not agree that the need is so great that we should be willing to pay any price to procure this helicopter.

In my opinion, the cost management of this program has been poor and we are faced now with a serious problem and I want to assure you the members of this subcommittee are not going to just sit here and throw money at the problem.

The subcommittee welcomes Mr. Ambrose, Under Secretary of the Army; General Vessey, Vice Chief of Staff of the Army; and

Lieutenant General Merryman, Deputy Chief of Staff for Research, Development and Acquisition, of the Army.

Gentlemen, in just a moment you may proceed as you see fit, but before you do, I will ask Senator Cannon if he has any statement he wishes to make.

Senator CANNON. Thank you, Mr. Chairman.

I am also concerned about the continued cost increase in the Army's weapon systems, including the AH-64. Such cost growth is a clear warning that these systems may no longer be wise investments, for two reasons: First, they may consume too many limited procurement dollars which would be unfortunate because other systems will be crowded and, second, there may be better alternatives in the same mission area in which to invest the same dollars to achieve more effectiveness.

Procurement costs are only part of the problems. In deciding whether to invest in one system or alternatives, all of the costs, including manpower and support costs, should be included. When these costs are included, initiatives in acquisition costs among alternative systems can diminish.

Further, we need to address performance of the alternative.

The AH-64 combines high payload and lethal weapons with an advanced attack capability. These capabilities are clear improvements over those of the AH-1 attack helicopters now in the field. The important question that we will have to decide is whether the addition to the existing force of nearly 1,000 AH-1 helicopters or the AH-64 is a better investment than some larger number of individually less capable helicopters when all the costs are considered.

Let me reemphasize that acquisition cost growth has affected too many major weapon systems in addition to the AH-64. In 1980 to 1981, 13 major defense systems showed program unit cost growth of over 20 percent. Five of these grew by over 40 percent in that 1-year period. This kind of 1-year cost growth is not acceptable because it casts considerable doubt on the wisdom of the original decisions about where to invest scarce procurement and development funds.

We must improve our ability to estimate costs and to keep costs close to these estimates, so that we don't have to decide over and over again about whether or not to continue with individual programs.

Mr. Chairman, it comes down to affordability and the best choice of alternatives.

I hope that the witnesses can clearly address these issues for us. This is an important program and it must be carefully examined before we decide on how to proceed.

Thank you, Mr. Chairman.

Senator GOLDWATER. Senator Byrd, do you have any statement?

Senator BYRD. I will reserve my comments until later, except to say that I am greatly concerned about the cost of this program and even more concerned that figures today apparently are vastly different from the figures given us only a couple of months ago.

Thank you, Mr. Chairman.

Senator GOLDWATER. Gentleman, you may proceed as you desire.

STATEMENT OF HON. JAMES R. AMBROSE, UNDER SECRETARY OF THE ARMY, ACCOMPANIED BY, GEN. JOHN W. VESSEY, USA, VICE CHIEF OF STAFF, U.S. ARMY; LT. GEN. JAMES H. MERRYMAN, USA, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION, U.S. ARMY; AND MAJ. GEN. EDWARD M. BROWNE, USA, PROGRAM MANAGER FOR THE AH-64 ATTACK HELICOPTER PROGRAM

Mr. AMBROSE. Mr. Chairman, I am James R. Ambrose. I am Under Secretary. Good morning.

Mr. Chairman and distinguished Members, if it is agreeable with you, I will work from the statement I have already submitted to the committee, because I wrote it more or less the way I thought, so I think I will be more comfortable with that.

Senator GOLDWATER. Your statement will be in the hearing record.

Mr. AMBROSE. Thank you.

As a preamble, let me say that I came into the Pentagon about the time this was breaking news and I share with you, Mr. Chairman, the shock of seeing this kind of cost increase and the implications of it. So, I engaged myself directly in investigating this program.

I have visited all of the major contractors and subcontractors. I have ridden in the helicopter myself. I have examined the field program. That, of course, is not going to make me an expert overnight, but at least it gives me some direct exposure to the situation.

It is my desire to discuss this program and any other programs at subsequent times with the Congress in complete candor. There is no other way to do business, in my book.

At this subcommittee hearing, coming as it does before the President has submitted the fiscal year 1983 budget, I have to limit my testimony to those portions of the program status which do not include reference to information contained in that budget. I believe that I can present to you and can go into the necessary details of this program in such a way that the subcommittee will be able to gain accurate insight into the current status and the ongoing actions of the program.

I have been in office, as I said, not quite 4 months. In that time I doubt that I have been able to learn as much about this program as you people already know in terms of its design, performance and requirements for this weapon system, but I have satisfied myself in the reviews that I have referred to, which have taken place in recent months, that the need is real and the performance will meet the specifications.

SERIOUS COST PROBLEM

There is a serious cost problem, as you have said, and I will get into that immediately. General Vessey and General Browne, whom you know very well—General Browne is the program manager—are here with me. They will contribute their knowledge and comments as we need them.

The bottom line at this moment is that there have been very serious cost increases in the program cost estimates and there is a

major disagreement with the prime contractor over the reasonableness of substantial portions of his proposed costs.

We are not going to enter into a contract for the production of this helicopter until we satisfactorily resolve this disagreement and find a way to limit the program cost to an amount we can afford and which is reasonable to pay for this capability.

I think our sentiments in this matter are precisely those which you have expressed already.

Having said that, I would like to give you a relatively brief exposition of the recent cost estimating history and the causal factors so far as I have been able to determine them and to tell you about some of the steps we are taking to stop this cost growth and to insure that the program cost will stay put during the production phase.

I have not gone back too far in history. I thought my effort was better spent trying to resolve today's problems and get the lid on tomorrow's performance. But let me say that I have tried to get some kind of rough assessment in the terms that are referenced in the thorough reporting method and, very roughly, I see it this way, that in that frame of reference we started out with a helicopter that was going to cost about $1.6 million. This is in fiscal year 1972 dollars as is reported in the SAR's.

To that were added, sometime over the period, about $300,000 added costs that were there all along but simply had not been reported in the original cost estimating. So, you started, really, with $1.9 million on today's accounting methodology, a helicopter to which have occurred about $500,000 of those kinds of dollars of program growth that is due to mistakes, bad estimates, problems that had to be fixed and things like that, and another $500,000 which has been added by deliberate actions of prior administrations, prior program management along the way, that deal with really additional capability.

In one sense, you might say in those terms you are looking at a helicopter that was about $2.4 million flyaway cost, that is now a $3 million helicopter.

Now, we all know what inflation has done to us and I am not going to try to trace through all of the intricacies of inflation accounting, but to me that put it in some focus, that we are looking at about a 20- to 35-percent change due to problems and mistakes, and a 25- to 30-percent change, due to deliberate additions of capability.

Nevertheless, I have to say that I suspect the past history of this program, unfortunately, resembles that of other major problems. It almost seems to be an institutional phenomenon that these projects start with gross underestimates by both the Government and the contractor, usually followed by modest growth in estimates during the early development phases, and then experiencing sharp increases toward the end of development and in the early production phases.

If it is appropriate later on, I will make some comments about what we are trying to do about the general situation.

We will see on the chart in a moment how that pattern has been experienced in this particular program.

As the chairman mentioned, we may have to get into the negotiating kinds of data and we would ask the committee to go into closed session so that we can protect the subsequent Government negotiating position.

TABLE 1

AH-64 PROGRAM COST ESTIMATES

(ESCALATED $'s IN MILLIONS)

	SAR MAR 81	SAR SEP 81	PM BCE OCT 81 536 A/C	ASARC NOV 81 536 A/C	PM EST NOV 81 446 A/C	ASARC NOV 81 446 A/C	PM EST BASI CONTRACTOR PROPOSALS
DEVELOPMENT	1138	1139	1233	1233	1233	1233	1233
PROCUREMENT	4821	4821	5955	6518	5336	5864	5994
PROGRAM TOTAL	5958	5960	7188	7751	6569	7097	7227
Δ FROM MAR SAR	–	2	1230	1793	611	1139	1269
UNIT FLYAWAY COST	7.3	7.3	8.7	9.7	9.0	10.2	10.5
UNIT PROCUREMENT COST	9.0	9.0	11.1	12.2	12.0	13.1	13.4
UNIT PROG. ACQ. COST	10.9	10.9	13.2	14.2	14.4	15.6	15.9

First, let me refer you to table 1 in the material that was supplied to the committee. Although this is a busy chart, I have tried to put on this chart the sequence of program cost estimates that have occurred since the SAR report of March 1981. These are in escalated dollars calculated according to the OMB rules of the period, and the intervening June SAR has been left out, simply because there was no change.

The December SAR is in preparation and will be submitted to Congress in late February.

Also on this chart or table are the program cost estimates presented to us in October 1981, by the program manager. That is the third column of this chart.

The fourth column is the program cost estimates approved by the November ASARC. This is the Army review group that reviews these major systems. These are all on a consistent basis, the 536 aircraft.

We decided as a result of the cost growth—and I will explain that in just a little bit—to reduce the number of aircraft to be procured in order to contain this cost growth in part. So, the fifth column shows the effect of making that change in the frame of reference of the program manager's estimates, October to November.

The sixth column is the consideration given to that changed estimate by the ASARC which, in effect, is General Vessey and myself acting as cochairmen, which includes an estimate provision for unexpected future cost that is not in the program manager's estimate.

Finally, in the last column is an estimate which we have prepared that takes the existing contractor proposals which are only for a short period of time and for a small number of aircraft and extrapolates them into the future years on the same basis that the program manager derived his own estimates.

Now, the nut of the problem here is to be found by looking first at the third column, program acquisition or procurement, either one. The program manager said in October he could buy 536 aircraft in procurement for $5.955 billion. I will not go over—if it is all right with you—the development growth, because it is essentially constant and mostly spent. I don't mean to say I ignore $1 billion, but I am trying to state what happened.

This is an increase of $1.1 billion from the SAR report of March 1981, and is the start of the problem that we are all talking about.

During the examination—and it was a very intense, month-long examination—in October and November, the Army concluded that it prudently should estimate the total program cost about $563 million higher than the program manager was estimating it based primarily on the history, prior history, on the uncertainties of production which had not yet started, and things of that sort.

This is, in effect, a contingency provision or a reserve and we have no intention of dipping into it—as I will say a little more strongly in a moment. But to continue the explanation, this, we felt, was more money than we wished to spend in this area, all Army needs taken together. It is not to say that we would not like to have this many or more helicopters, but we have a lot of things we have to do with the money that we are given.

So we reduced the quantity of aircraft, and I will explain in a later chart that that was not just an arbitrary number, but it was a deliberate consideration of the operational use of this, from 536 to 446, and that reduced the amount of the estimate that the program manager was giving us by about $654 million.

This is still high compared to the March estimate of the SAR, by approximately $1 billion, not an agreeable thing at all to have to come in and say we are going to have to spend more money and get less for it.

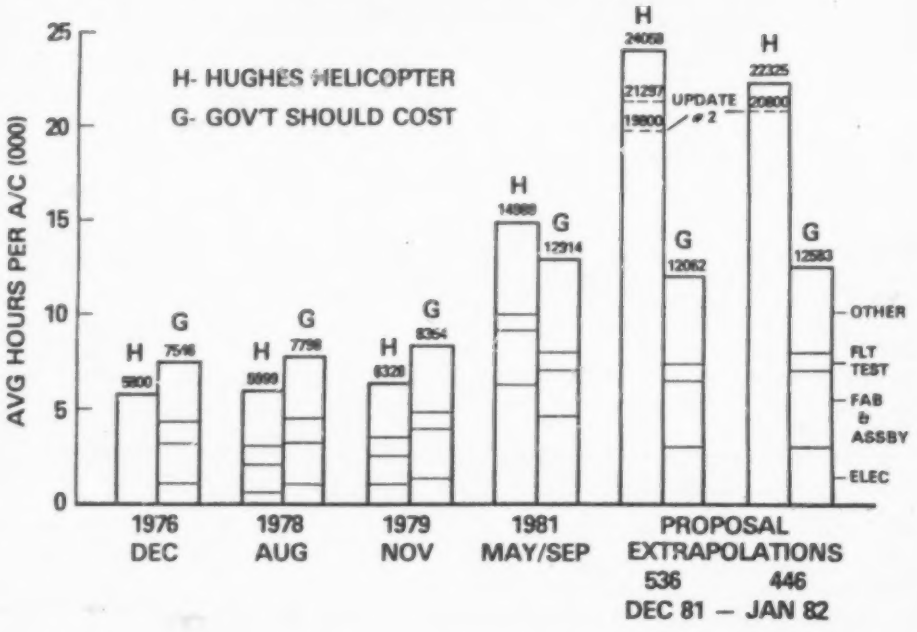
The current situation with respect to the contractors—we do not have negotiated contracts with the major contractor and subcontractor—is shown on the last column. This, on the same basis, is about $658 million higher than the program manager estimates he can get the work done for. It is that problem that we are currently wrestling with and it is that problem that we are going to solve to our satisfaction before we enter into these contracts.

Negotiations have been running in one way or another ever since the proposal was turned in at the end of December. There has been a lot of factfinding. We have gotten some reductions and we have shown the reductions in this last column, but it is still $658 million higher than we think the job should cost.

I hope I have not given you too much of this, and we can go back over all of this to any extent that you want, but I would like to go on for a moment to the next chart, table 2, which shows you—or I have tried to show you—what has gone on.

TABL 2

HHI/GOVT DTC — SHOULD COST
536→446 UNITS
MANUFACTURING LABOR HOUR COMPARISON



This contract, as I think other contracts of a major kind, has proceeded for some years with efforts to estimate the average cost of the airplane in production, called design-to-unit cost or similar terms. Back in 1976 the first of these estimates was produced—I am not sure it was the first but in any event an estimate was produced—at that time by both the Government and the prime contractor.

The prime contractor is the column labeled "H" and the Government is the column labeled "G". The story is told in average hours of labor per aircraft, but that, of course, reflects itself eventually into the dollars. I have told it this way because the data are at hand in this fashion.

At that time you see the estimates of the Government and the prime contractor are not too far apart. The Government feels it costs more than the prime contractor. There aren't a great deal of precise design data available and both are preparing estimates from parametric analyses that involve comparisons with other airplane programs that have a history with componentry that is similar to something else and methodology of that sort.

You see through the developmental period for the next 3 years very little happened to those costs. Then the next formal submission of this kind, in May of 1981, the hand grenade goes off in everybody's face here and the costs virtually doubled. That is bad enough, but in December the prime contractor has turned in a proposal that is a further increase from almost 15,000 hours to 24,000 hours.

TABLE 3
TOTAL PROGRAM COMPARISON
BY
MAJOR CONTRACTORS

	SAR MAR 81	PM 536 OCT 81	ASARC 536 NOV 81	ASARC 446 NOV 81	DELTA FROM MAR SAR	REMARKS
HUGHES	2730	3684	3684	3322	+592	HARDWARE INCREASES IN BASE LABOR AND MATERIAL; INCREASED LABOR IN SYSTEM PROJECT MANAGEMENT;* INCREASED TOOLING, TRAINING HARDWARE AND NONRECURRING TESTING.
MARTIN MARIETTA	762	957	957	874	+112	INCREASES IN GSE(ATE), HARDWARE, SYSTEM PROJECT MANAGEMENT;** AND TOOLING.
GENERAL ELECTRIC	920	922	922	809	−111	INCREASES BASED ON BLACK HAWK SIXTH YEAR COST PROPOSALS, OFFSET BY QUANTITY DECREASE OF TOTAL ENGINES (1072 vs. 892).
GOVERNMENT	409	392	392	331	− 78	FEWER ASE/KITS FOR REDUCED AIRCRAFT QUANTITY, AND LESS COMMAND SUPPORT DUE TO SHORTENED PRODUCTION BUYOUT.
PROVISIONS FOR MOST LIKELY COST	—	—	563	528	+528	
TOTAL	4821	5955	6518	5864	+1043	

* SYSTEM PROGRAM MANAGEMENT INCLUDES PROGRAM MGMT, ILS MGMT, PROJECT ENGINEERING SUPPORT, AND COMPUTER RESOURCES.

** MARTIN MARIETTA SYS PROGRAM MANAGEMENT GROWTH REFLECTS CONTRACT NEGOTIATIONS WHICH FULLY DEFINED PROJECT MANAGEMENT, RAM, AND ILS SUPPORT REQUIREMENTS.

This is the same contractor who said 4 or 5 months before that it was only going to be 15,000 hours. That causes me more of a shock than the doubling that was reported in May. The Government does not agree with this. The Government's position remains virtually the same now as it was back in May.

I am not here to tell you that I have complete faith that the Government estimate is right, but I think it is much more nearly right than this very sharp increase on the contractor's side.

There are details in here and we can come back to this chart, if you will. I won't belabor them at the moment.

The little lines that are shown in certain of the columns show the elements of manufacturing effort—electrical, fabrication and so forth—and if you care to get into it, you will see where the chief manufacturing elements were driving the cost up. The biggest one by far is in the electrical work. We see that on another chart.

On table 3 I have tried to indicate where the principal causes of this $1 billion increase have been. I won't go through every one of these unless you wish, but the biggest pieces obviously are the prime contractor is up from March of 1981 by $592 million. The contractor that makes the sight, the so-called TADS/PNVS, infrared and visual aid devices, is up $112 million.

The next biggest item, virtually as large as the increase in the prime contract, is a "provision for most likely cost," which we have deliberately added. We do not intend that that money be spent if we can possibly help it, but we felt for ourselves and for the Congress it was more responsible to say that based on the track record

so far, we had better estimate more prudently. So, there is a $528 million increase due to that.

Now, the causal factors—and I think I will just recite these and leave it at that for the moment but I am sure we will come back to it, and I will come back to it—I recited in the remarks, but these are causal factors in an accounting sense, if you will. They don't really say what happened, why did it go up in these sums.

I would like to get on to the rest of the pattern and then come back to that.

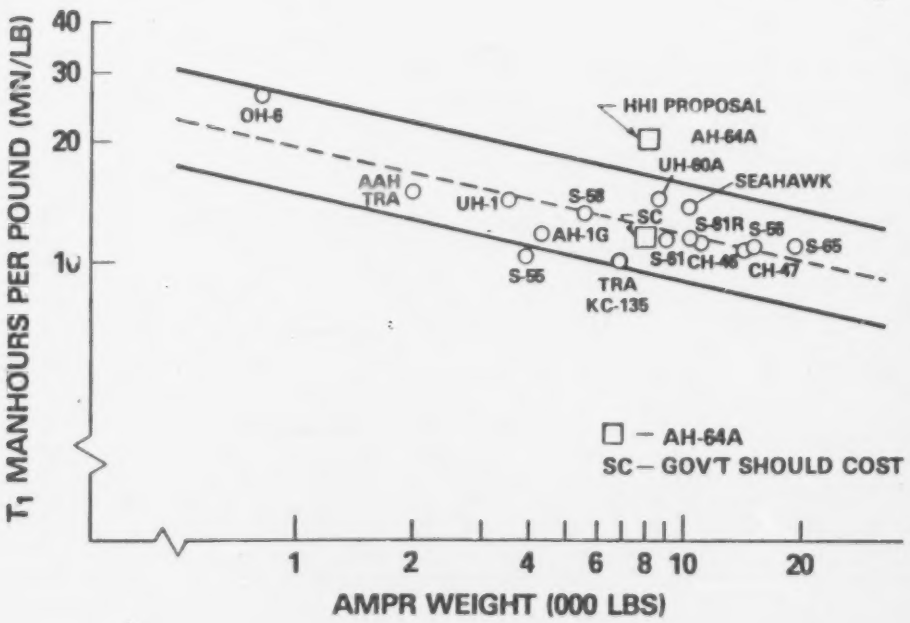
Most of the increases that we are looking at are increased labor costs, increased tooling costs, increased associated testing and things of that sort.

There were some offsetting effects, primarily due to the decreases. Keep in mind that all of these increases are after reducing the number of aircraft, so if you were looking on an apples-and-oranges basis you would be looking at even a bigger number.

We tried to understand—at least those of us in management have tried to understand—whether we were looking at something reasonable. That is not an exact science by any means but on table 4 there is an attempt to put this proposal, this current proposal, in some frame of reference with respect to other helicopter programs.

TABLE 4

HELICOPTER COMPARISON
T_1 (HRS/LB) vs AMPR WT



The chart generally shows—and this is a standard airframe-only kind of measure that the industry uses, this weight parameter—the chart generally shows that most programs have fit rather well in a band that runs across the page in proportion to the weight.

The current proposal we have is the square above the band and it is our view, my view, that this indicates the proposal is out of line with the run of our experience with helicopter programs.

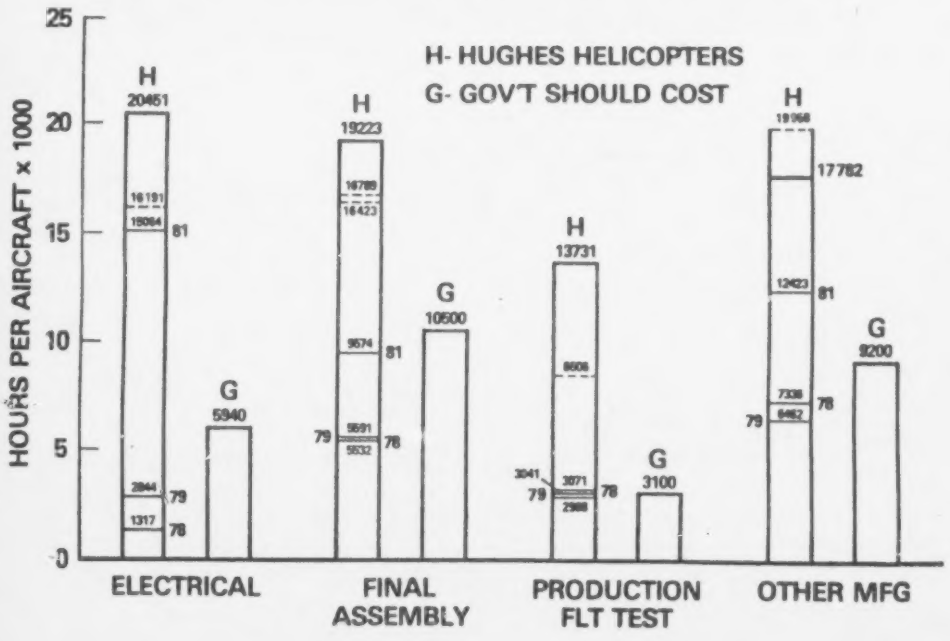
As to other reference marks on this page, note a square that is in the middle of the band labeled "SC." There is where the Government "Should Cost" numbers that I referred to on the prior chart places the Government estimate. It is a test of reasonableness, not as an exact science. It is somewhere in the experience band that other programs have had.

You will notice to the left of this chart something called AAH/TRA, that there is a little circle also in the band and below the average line. That is where the subcontractor performing the bulk of the airframe of this aircraft stands with his proposed effort, actually a fixed-price effort.

As another comparison check, the same contractor—this is Teledyne-Ryan—actually this is a KC–135; it has nothing to do with the helicopters, but it is another piece of airframe work that this same contractor is doing also within, and indeed within, the low side of the band. I think that again, although there is no exactness to this, the indications to us are that as a general matter this proposal we are looking at is too high; it is out of line with competitive industry.

TABLE 5

HHI/SHOULD COST, 11 A/C
MANUFACTURING LABOR HOUR COMPARISON



If we go on to the next chart, table 5, I have tried to display another aspect of this which is the comparison of the manufacturing labor hours between the prime contractor's present proposals, and there is a certain amount of busywork in this which I will explain in a moment, and the Government "Should Cost" position at the moment.

First, let me say about the Government "Should Cost" position that it is probably somewhat low. The reason for that is in the development of the Government "Should Cost" numbers they are primarily examining contractor-furnished information, and where there is inadequate information they simply put down a zero, which is not the current number.

So, it is our estimate, until this work which is in progress has been completed, that these Government estimates may well be low by something on the order of 10 or 15 percent, perhaps 20 percent; but that will not change the general pattern that you see displayed here, where in the electrical area there is a difference of well over a factor of three between the Government's view of what it takes to make the electrical work in this aircraft and the contractor's.

In this chart we are talking about the proposal for doing 11 aircraft, not about the average over the whole proposed buy. The busy lines in the prime contractor column on the electrical show the information that we have gotten from the same contractor from time to time. In 1978 the estimate was 1,317 hours. In 1979, 2,844, virtually double. In 1981 it is 15,064; that is in May 1981. In December, his proposal said it would take 20,451.

Since the proposal has been submitted through the work of the "Should Cost" and negotiating teams, the 20,451 has come down to 16,191. I won't go through all of this unless you wish, but you see similar patterns, very wide disparities in the other categories.

As far as I am concerned, this is simply too much to leave standing. It has got to be resolved. If they can show that it takes more to do the work than we believe it should, legitimately, we will concede that, but until they can show that, we are not about to allow the production to proceed on the basis of taking three or four times as much effort to do the work as we think it ought to.

It may be a long summer before we get that settled, but we are going to stay with it.

Finally, we have an audit report from DCAA which indicates in a number of details—and I won't go into them here—that the contractor's submission is unacceptable and we are not going to go into a contract with a bad audit report finding.

Faced with all of this—and it is all disagreeable; it is not at all pleasant to come over here and say we have this much trouble—we have, first of all, gone back through the requirements of this system and we concluded that we have to have it. I think there is some indicated support from you gentlemen that confirms this also. General Vessey and General Brown can tell you a great deal more than I can about that, but since it may get into classified matters, I won't go further at the moment.

We also think—and we have gone back and run a number of model games again that are the basis for these estimates—we think it is cost effective even at substantially higher costs than

were originally used to defend it. But I am not going to support that as a way of rationalizing these cost increases.

We have also gone into the quantities required. We start, as I think you well know, with a desired quantity that is way above the quantities that were considered in the budgets at any time. They were faced with an opponent that has considerable more of these helicopters than we have. So, it is not a matter of ever having asked for an excess of these. It apparently has always been on an affordability basis.

TABLE 6.—AAH DISTRIBUTION PLANS

	108	108
	54	54
	54	54
	18	18
	72	72
	18	18
	36	36
	18	18
	18	0
	18	0
	18	0
	18	0
Total	450	378
TDA	26	26
Float	60	42
Procurement objective	536	446

Very reluctantly, we have reduced that quantity. We have on table 6, shown an accounting. This accounting actually has derived from a complete reckoning of where the plans were to put these things. We have deleted four companies out of 25, is what it comes down to at the bottom line, but it has been done on a company-by-company, priority-by-priority basis. It is not an arbitrary number.

These numbers have been accepted by the operations and training and doctrine people; they are real; they hurt, but we will do it. We have to do it because we have other things that we have to do in the Army besides finance overruns on these troubled programs.

If the program manager and the contractor can find ways to get more helicopters for the money we give them—and we certainly hope they can—we will welcome that and let them do it, but we are not going to give them any more money than the money approved by the ASARC in November.

As far as I am concerned, the responsibility of the program manager is to live within his estimates, not within the estimates provided by the ASARC increase.

We have put off the DSARC—that is, the Defense Department, and I am sure you know this better than I—approval of this program until we have assured ourselves that we have an executable program at a fair price.

Meanwhile, we have funded temporarily efforts to both maintain our ability to meet schedules and to retain advantageous provisions that have been worked out in certain of the subcontracts, basically and primarily the TADS/PNVS, that are very advantageous to the

Government because they put a cap on the entire production buy of that item.

In that case we feel quite definitely that we know where we stand over the entire cost of the program. We also feel we know fairly well where we stand with respect to the engine, so that at this point in time the principal question is to find out where we stand with the prime contractor.

I have described repeatedly, and I won't go into it much more, this negotiation with the prime contractor. I asked the president of his firm to meet with me last week. I gave him substantially the same account and the same viewpoint that I am giving you today. I have assured him that the Army is determined to rectify these cost problems. I have asked him to consider placing a cap on his work for the future years' production.

One result of these efforts—though I don't wish to leave you with the notion that it is the end of it by any means—coupled with the continuing negotiation and cost fact-finding of the program manager—has been a reduction of nearly $20 million in the fiscal 1982 proposal cost that we just got a couple of days ago, but I have already included that.

These negotiations are in progress and will continue on an urgent basis.

We have looked at every conceivable form—that is probably too generous a claim—we have looked at everything we can think of, and we welcome other suggestions with respect to breaking out components, getting competition, not just at the prime level, so much as the second source and component level, changing the production processes, putting in more efficient tooling.

We have already introduced over 300 producibility improvement changes in forgings and castings which is where the bulk of this has been done.

One of the big problem areas has been growth in the number and unit cost of putting in electrical wires. I don't remember off the top of my head the number, but there has been a growth of something like a factor of four or so in the total number of wires in this airplane compared to what was estimated to be put in there in the first place.

The costs that are currently contained in the production estimates are high, we believe, compared to industry practice by at least a factor of two or three. So there is a lot of cost in just the writing of this thing.

The contractor has put into his proposal an inefficiency factor that has to do with starting up the work in a new facility that will be built in Mesa, Ariz. We don't believe that there is going to be that much of a problem.

We also think that the indications are quite strong that he is going to get significantly lower labor rates at Mesa than he has included in his proposal. I base that statement on his own work done, not on just speculation on our part.

I hope in this statement I have given you a reasonable amount of insight into the situation on this program and our determination to get this situation under control and the actions that are going on to accomplish this.

I have talked probably considerably longer than I really should have.

The one question I have not addressed in any detail is why, and what can be done about the why. Perhaps though, if it is agreeable with you, I could stop and respond to questions on these matters of fact first, and then come back to the questions of why the belated disclosure and so forth, subsequently. Is that agreeable, Mr. Chairman?

Senator GOLDWATER. Yes, that will be fine.

[The prepared statement of Mr. Ambrose follows:]

Mr. Chairman and distinguished members: I am here at your request to discuss the current situation on the AH-64 attack helicopter program.

It is my desire and intention to discuss the AH-64 program, and any other Army programs, with the Congress in complete candor. At this Committee hearing, coming as it does before the President has submitted the FY '83 budget, I have to limit my testimony to those portions of the program status which do not include references to information contained in that budget. I believe that nonetheless, the Committee will be able to gain accurate insight into the current status and on-going actions of the program.

I will be pleased to appear again before the subcommittee next week or at a later time or to provide the remainder of the information in written form.

I have been in office not quite 4 months. In that time, I doubt that I have been able to learn as much as you already know about the design, performance, and requirements for this weapon system. But I have satisfied myself in the intensive re-

views which have taken place in recent months that the need is real and the performance will meet the specifications.

There is a serious cost problem. I'll get into that immediately.

General Vessey and General Browne, whom you know very well, are here with me. They will contribute their knowledge and comments as needed.

The bottom line at this moment is that there have been very serious increases in the program cost estimate; and there is a major disagreement with the prime contractor over the reasonableness of substantial portions of his proposed costs. We are not going to enter into a contract for the production of this helicopter until we satisfactorily resolve this disagreement, and find a way to limit the program cost to an amount we can afford and which is reasonable to pay for this capability.

Having said that, I would like to give you a relatively brief exposition of the recent cost estimating history and the causal factors; describe some of the major differences which give rise to the disagreement; and tell you about some of the steps we are taking to stop this cost growth, and to insure that the program cost will stay put during the production phase.

I have not gone back too far in history. I thought my effort was better spent trying to resolve today's problems and get the lid on tomorrow's performance. But I have to say that I suspect the past history of this program unfortunately resembles that of a number of other major programs. It almost seems to be an institutional phenomenon that these projects start with gross underestimates by both government and contractor, usually followed by modest growth in estimates during the early development phases, and then experiencing sharp increases toward the end of development and in the early production phases. If it is appropriate later on, I'll make some comments on what we are trying to do about the general situation.

Some of the information that we might want to discuss this morning would be sensitive relative to the on-going negotiation. I assume that the committee can go into closed session at the appropriate time to protect the government position, if that situation should arise.

First, let me display the program cost changes that have occurred since the SAR report of March, 1981. Table 1 gives you the total program costs in escalated dollars reported in the March and September SAR's.

The "December" SAR report is in preparation for submission to Congress in late February.

Also on this table are the program cost estimates presented to us in October 1981 by the program manager, the program cost estimate approved by the November ASARC, and a cost estimate which is derived by extrapolating from the contractors' proposals through the production years.

Before I go to a simplified graph which I believe gets to the root of the problem, the points to note are:

1. From March to October the procurement program cost increased $1134 million.

2. During its examination of the program in October through November the Army felt it was prudent to increase the program cost estimate by $563 million, because of the cost history that had been exhibited.

3. To help contain the cost growth, the Army then reduced its quantity requirements from 536 to 446, an action I will explain later; and revised the production schedule to produce more economically. The effect of these changes is contained in the program cost estimate approved by the November ASARC, which reduced the procurement program cost by $654 million. This is still higher than the March SAR for the larger quantity by $1,043 million.

4. The prime contractor submitted his proposal for fiscal year 1982 for 11 helicopters and long lead items for the revised production program on December 31. The estimated program cost, including this proposal before any negotiation, was $6.36 billion.

5. Negotiations to date have reduced this estimated program cost to $5.99 billion, which is $658 million higher than the program manager's November 1981 estimate of $5,336 million. The ASARC added $538 million to the program manager's estimate to accommodate the most likely cost for 446 aircraft.

6. I will provide later a discussion of the reductions taken in other procurements to contain this budget.

I hope that I have not given you too many cost estimates, but I think it is necessary to understand the sequence of events and to be sure that we are using the same reference points when we talk about cost growth.

Now I would like to go to Table 2. In this simplified chart, I've tried to show what has gone on. On this chart are shown both government and contractor design-to-unit-cost labor estimates. You can readily see the phenomenon I mentioned earlier. For several years both government and contractor estimates were stable and far

below today's estimates. Then last year they both doubled, approximately. I'll get into the explanations for that in a moment. This was bad enough, but then, when the contractor's proposal came in December, there was another sharp increase, this time not accompanied by an equivalent increase in the government estimate. And, while there has been some movement downward in fact finding and negotiation, there is still a major unresolved difference.

Table 3 shows the principal items which have caused the increase from the March SAR. I have taken it step-by-step through the program manager's estimate in March and October, the effect of quantity reduction, and the ASARC provision for "most likely" cost added to the program manager's estimate. I will discuss any of these at greater length that you may wish.

To show you some of the magnitude of the disagreement we are trying to resolve, I have prepared two charts. The first, Table 4, compares the AH-64 proposal and should-cost estimate for bar airframe according to a standard industry definition with equivalent costs for other helicopters. It appears that the proposal is quite high. This can't be considered an exact difference, however, because there are many other variables. But it seems to be out of line.

The second, Table 5, compares the contractor proposal and current government should-cost for manufacturing categories. The government should-cost estimate may be somewhat on the low side reflecting insufficient input from the contractor on which to make a judgment. Nevertheless, there is just too great a difference to accept. A lot more work has to be done.

Finally, we have an audit report from DCAA which indicates the contractor's submission is unacceptable. We will not enter into a contract until this has been cleared up.

Now faced with this situation, we have done the following things:

1. We have intensively reinvestigated the requirement for this system and conclude that we must have it on the battlefield. I think you know, without going into classified matters, why that is so. We also believe it is cost effective even at substantially higher costs than were used in the original COEA. (But we are not going to rationalize the present costs away on that basis.)

2. We have equally intensively gone into the quantities required. Reluctantly, we have reduced the quantity by deleting the lower priority planned assignments. Table 6 shows what changes were accepted by the Deputy Chief of Staff for Operations and Plans and USA Training and Doctrine Command. These reductions are real. They hurt. But we will do it. If the program manager and the contractor can find ways to get more helicopters for the money we give them, we'll welcome that and let them do it. But no more money.

3. We have put off the DSARC until we have assured ourselves that we have an executable program at a fair price. Meanwhile, we have funded continuing efforts to protect deliveries and to retain the advantageous provisions of previously negotiated Fixed Price Contract options.

4. The TADS/PNVS contract will contain very innovative terms benefiting the government. In effect, they will cap the recurring cost of the entire production buy. There will be a sharp profit hit to the contractor if he falls short, and a fair chance to make more profit if he does better than estimated.

5. I've described the intensive negotiation with the prime contractor. I asked the president of this firm to meet with me last week. I gave him substantially the same account and viewpoint I have given you today. I have assured him of the Army determination to bound and rectify the cost problems we see. I've asked him to consider placing a cap on future years production. I've invited him to bend every effort to get these costs issues resolved. One result of these efforts, coupled with the continuing program manager's activities, has been a reduction of $19.5 million in the fiscal year 1982 proposal costs which we just received from the contractor on Tuesday of this week. That reduction has been taken into account in the estimated program costs of $5.99 billion I mentioned earlier.

Fact finding is still in progress and formal negotiations will commence as quickly as we can get through the fact finding.

6. We are examining every available action of breakout, competitive sourcing, production process changes, and more efficient tooling. There have already been well over 300 producibility improvement changes introduced in such things as forgings and castings. One of the big problem areas has been growth in the number and unit cost of electrical wires. We are particularly looking at ways to produce these wires at lower cost.

7. The contractor has provided an added inefficiency cost factor for start up in the new facility at Mesa, Arizona. We believe that there will be less of a problem there

than retention of the program at Culver City. The indications to date also are that he will achieve significantly lower labor rates at Mesa than he used in his proposal.

I hope in this statement I have provided you with reasonable insight into today's situation on this program, our determination to get the situation under control, and the actions that are going on to accomplish this. I will be pleased to respond to any questions or comments you may have.

Senator GOLDWATER. General Vessey, do you have anything?

General VESSEY. I have nothing at this time, sir, other than to say that we have continued to count on the flexibility that the attack helicopter will give us and the killing power in the development of our tactics.

The program is a very important program. The cost problems are very clear and real. We need to solve those and we need the helicopter.

Senator GOLDWATER. Thank you.

The chairman of the Armed Services Committee is present this morning. I am wondering, Senator Tower, if you have anything you would like to say.

Chairman TOWER. I want to commend the chairman of the subcommittee for continuing this hearing. I think this committee strongly supports Army modernization programs. We all recognize that the greatest asymmetry in terms of the relative military posture of the United States and the Soviet Union lies in the ground forces, and the greatest margin of Soviet superiority is in terms of ground forces, not just in terms of numbers but also in terms of the quality of the equipment they possess. We no longer have a qualitative edge over them. They have a qualitative edge over us, so modernizing Army systems is imperative.

However, I must concur with Senator Goldwater that we are not going to acquire these items at any price. To do so would not only jeopardize other Army modernization programs but also would jeopardize other new programs which this committee seeks to support and defend. So, I am hopeful that we can get to the bottom of this issue and we will get some satisfactory answers.

I intend to cooperate with Senator Goldwater in any way possible.

Senator GOLDWATER. Thank you, Senator.

I have a few questions and then we will go to our fellow members.

AH-64 COST INCREASE

Mr. Ambrose, when did this significant increase in cost become known to the AH-64 program office?

Mr. AMBROSE. Mr. Chairman, I believe that the beginnings of insight into this rise were in the period February to April 1981. The information became available in pieces as the program and the contractors worked toward the submission of the required design-to-unit cost, which was actually submitted in May, so I don't think there was a single moment when the whole of it dropped out of the sky.

Senator GOLDWATER. Then why on June 11, 1981, did the program office brief the committee staff that no cost increases were foreseen? This is just last year.

Mr. AMBROSE. General Browne, would you care to comment on this?

General BROWNE. I think, if I remember my words correctly, I was asked specifically whether or not there were going to be any increases in the cost of this aircraft in production. I think, if you will read the testimony verbatim, it says something, paraphrased, to the effect that I could not tell you at that point in time whether or not we would be able to buy the 536 aircraft at that price.

We had gone back and looked over all the track records and cost growth in another recent program, Blackhawk, and attempted in our design-to-cost reviews to pin all those things down and be able to buy you the aircraft at the price we were going to advertise when we came through with our DSARC decision. I believe you will find that is pretty much a verbatim extract. I did not say that we had not foreseen cost increases at all.

Senator GOLDWATER. General, I don't think you made that statement. I think the program officer in the Pentagon made that statement.

General BROWNE. No, sir; I did brief the subcommittee over here and we do have the testimony available, sir.

Senator GOLDWATER. I don't recall that you said exactly this. We got it from the program office in the Pentagon.

General BROWNE. I am not familiar with that particular session you are referring to, sir, but I did discuss the cost of this program and did give testimony before the subcommittee that states exactly, paraphrasing, what I just told you.

I incidentally pointed out specifically that when we did our design-to-cost review for the production run at the point in time where we would have those figures and go through our ASARC deliberations, that I would then stake my reputation to you on the cost I gave you as we went to production that we would procure them for that.

Senator GOLDWATER. Let me ask you this: Two years ago the cost of the AH-64 was $3.44 million each in constant fiscal year 1972 dollars. Now what is the cost estimated to be today in the same constant dollars?

General BROWNE. In constant fiscal year 1972 dollars, sir, we are talking about a $3 million flyaway cost airplane.

Senator GOLDWATER. Today?

General BROWNE. Yes, sir.

Senator GOLDWATER. Less than it was 2 years ago?

General BROWNE. That is right. Then on an escalated basis where we have a problem in terms of all the program acquisition costs and based on the 446 quantity, we have a $15.6 million aircraft, including R. & D. and all of the procurement.

Senator GOLDWATER. Of course, that is what we are interested in.

How did this thing get so high without either you or the Army knowing it, or this subcommittee or the full committee being informed of it?

Mr. AMBROSE. If I may respond to some extent, I have not been around very long, but it is clear to me that one of the generic problems that we have to face, have been facing, is to get more timely disclosure of the situation on these programs. More timely disclosure is not peculiar to this program; it seems to be more wide-

spread. More timely disclosure includes disclosure of all of the associated costs. It is not enough just to know what the variable costs of the airplane or the weapon system are.

There is a problem that we have to wrestle with in that the program managers, if they are to do their function properly, have to be given some opportunity to first verify that what they are being told is correct and, second, find some way to get back down from these cost increases.

But I think as an institution, the Army and DOD have let these kinds of information go on much too long at the lower level of the organization, in the hope, I suppose, that they would be able to find some way of resolving it. I think that hope is patently not well founded.

So, we have instituted new means, General Vessey and I, in particular, have instituted reporting schemes and assigned people whose sole function is to get that information out of the system and into our hands on these major programs very promptly from the time that it is actually into existence. That is one part of it.

The second part is that we are waiting on these contract end points or SAR reporting dates to pull the information into a complete form. That sometimes introduces as much as a year or 18 months between design-to-cost reviews, for example.

The chart I showed you there was an interval of just about that sort, the year and a half from one look to the next. You can't make a formal, complete design-to-cost review every month, I don't think, but that interval is simply too long and in that period individual groups, individual people, obviously knew more wires were going into that airplane, more costs here, more something there, and we have to get more frequent reporting by quite a bit than this.

I think the explanation—and it is not a very satisfactory one—is that the methodology of the reporting system was simply utilized to delay the explicit casting up of the score and reporting it either to Army management or anywhere else. I can't get that back, but it certainly will not happen in the future.

Senator GOLDWATER. I would like to get back to General Browne. I just can't believe the statement you made that the constant fiscal year 1972 dollar position is less now that it was 2 years ago when the acquisition cost of the program has gone from 10.9 to 15.9 actually in less than 1 year.

General BROWNE. I understood you to say, Senator, that the flyaway cost was $3.4 million. I do not recognize that as a valid number because our flyaway cost is $3.01 million today, in fiscal year 1972 dollars, which is less than $3.44 million. Today we have a $3.9 million procurement unit cost on a 1972 dollar basis. We have a flyaway cost, which is everything over the fence ready to go and fight, of 3.01, which is what I was understanding you to say, and we have a program acquisition unit cost in 1972 dollars on today's program of $5.44 million.

Now, those would be obviously higher than 2 years ago because of the reduction in quantity as well as the cost growth. I don't recognize a 3.9 flyaway cost 2 years ago. Perhaps I misunderstood you.

Senator GOLDWATER. So that we can better understand that, I would like to have you submit to this committee in writing your reason.

General BROWNE. Yes, sir.

Senator GOLDWATER. I just can't follow it and I can't accept the idea that the constant dollar is lower today than it was 2 years ago when the cost of acquisition has gone up.

Mr. AMBROSE. Senator, there has been some misunderstanding and we will provide it in writing. The cost is not lower today than it was 2 years ago. I think the difficulty is in talking about these various ways of expressing the cost.

We will put it in writing and give it to you. But, today, the cost in 1972 dollars is approximately 50 percent higher than it was in the beginning.

Senator GOLDWATER. I still would like that explanation.

Mr. AMBROSE. Yes, sir.

[The information follows:]

General BROWNE. The $3.44 million (constant fiscal year 1972 dollars) that Senator Goldwater quoted is the program acquisition unit cost prepared in 1976 and is the development estimate for the baseline program. The $3.01 million (constant fiscal year 1972 dollars) that I stated is the flyaway unit cost for the present program. These are not comparable figures. For clarity, the 1976, 1980 and 1982 unit costs are:

	Unit flyaway		Unit procurement		Unit program acquisition	
	Fiscal year 1972 dollars	ESC dollars	Fiscal year 1972 dollars	ESC dollars	Fiscal year 1972 dollars	ESC dollars
Dec. 31, 1976, SAR (development estimate)	1.80	4.06	2.36	5.27	3.44	6.90
Dec. 31, 1976, SAR	2.09	6.45	2.60	8.35	3.81	10.60
Feb. 4, 1982, estimates	3.01	10.16	3.90	13.15	5.44	15.60

DISCOVERY OF COST INCREASE

Senator GOLDWATER. Now, when did the Army staff learn of this cost increase? The first presentation that embraced these increases in cost, I believe, was in late September or early October of 1981. Then why wasn't the committee notified prior to December 10, when the program manager briefed our staff on December 10, 1981, that he was aware during the summer that the program could not be executed for the funds that were then projected?

My question is, why weren't we told about this?

Mr. AMBROSE. I am sorry, sir. I don't know what you were told in December.

Senator GOLDWATER. Why wasn't the committee told of this cost increase in the briefing that we had on the 10th of December 1981?

General BROWNE. It wasn't a briefing, Senator; it was a discussion with a couple of the staff members in your office. They asked me to come over and talk to them about what was the decision out of the November ASARC. They asked at that time when did we first see some of these costs coming. I told them in the summer, as we were doing our design-to-cost review across all 17 major subs and the primes that we saw the costs beginning to grow.

We also alerted the Department of the Army to that. We did our total wrapup in design-to-cost and baseline cost estimate and presented it—we finished it in late September. It went through the

Army review process and was briefed to the ASARC community in November.

Mr. AMBROSE. These costs were reported to us in early October, I believe. There was a November ASARC. The cost information at that time is on table 2. I can't say what was told to your staff.

As a consequence of the state of the program and in particular the lack of a submitted proposal by the prime contractor at that time, I asked the OSD to postpone the DSARC because it simply wasn't possible to go forward with this program with such uncertainties, and at the same time asked OSD/DDR&E to release enough funds to keep certain of these contracts going, in the fashion that I told you, that existed in the time period you are talking about.

I can't speak personally as to what your staff was told. I see no reason why it should have been different.

Senator GOLDWATER. Actually, there is no rule in the Pentagon that requires any branch of the military to report any increases to this committee; is that true?

Mr. AMBROSE. I am under the impression that there is a quarterly report to the Congress required of this program.

Senator GOLDWATER. I understand that there is no rule that General Browne or anybody else connected with the program, or the Secretary of the Army, has to make a report to this committee on increases, and I think there should be that rule.

Mr. AMBROSE. I certainly feel, myself, Senator Goldwater, that we should tell the committee whatever it wants and needs to know whenever it wants to know it, and it should be told exactly the way it is.

However, wiser heads in the ways of the Pentagon than I am will have to say whether that is a rule. It is the practice on my part to make such communications when there are problems. Whether it is a rule or not, I can't say, personally.

Senator GOLDWATER. If we want the information, we get it, but I think it ought to be mandatory that we get a report on any cost increase on any weapon system.

Mr. AMBROSE. I don't have any problems with that.

Senator GOLDWATER. Senator Warner?

Senator WARNER. General Browne, let us look at you as an individual for a moment. The facts I have indicated that your career with this program is a model of what every project manager hopes to achieve. Am I correct, you have been on this how many years, 4 or 5?

General BROWNE. Approximately 6 years, 6 years on May 31.

Senator WARNER. During which time you have gone from the rank of colonel to major general in the Army; is that correct?

General BROWNE. That is correct.

Senator WARNER. During that period you received an award of program manager of the year?

General BROWNE. Yes, sir.

Senator WARNER. So, we have in terms of a career success pattern for a project manager the model of success superimposed on a program which appears to be a model of failure.

Now, in your own words, what do you think the causes were?

ESTIMATING TECHNIQUES INADEQUATE

General BROWNE. I think our estimating techniques that all of us have been, I would say, bounded by, are inadequate to project costs 5 to 7 years in the future.

We took the Army's best cost technicians available out of the commands that support us. We put them to using the parametric analyses that everyone uses to do these projections, and we did them rigorously and more frequently than most, yet our cost estimates when we came to the production decision skyrocketed.

I have to suggest that the methodology that we use for cost estimating does not have the kind of crystal-ball clarity that we need or would like to have to project accurately those costs into those future years.

I really believe what you are seeing is what happens as the design evolves from a start with a clean sheet of paper in 1972 for an attack helicopter with a projection of what they are going to cost in 1976, the sheet was clean in many areas, such as system integration and subsystems. When you start evolving the design—build hardware, test, it breaks, changing it, you redo it, test, it breaks again—and then as you get closer to the production decision a much cleaner definition of what it is that you will have to produce in the machine shops and in the factories. To put on the line a helicopter or any other machine; I suggest to you, sir, that we don't have a very good recipe to do that kind of cost analysis and projection with the clarity that we all would like to see.

Senator WARNER. Now, there is frequent reference to the fact that the reporting system was faulty, the information did not come up in proper time.

Is there any implication that the contractor withheld information or in any way tried to cover this up? Is part of the fault on their doorstep?

General BROWNE. I would state it in this manner. I don't think there was any intentional covering up of cost. I think, fundamentally, that they did not know what it takes in a program that has the equipments that we have on this attack helicopter, it is the first time that we have really attempted to assemble in this fighting machine all of these new technologies.

It was a very difficult task and, incidentally, we have been highly successful in achieving the capabilities that we set out to get. In the process, all the changes that came about through what the contractor was learning along with the Government as to what cost it would take in the ultimate to finally produce it, in the sense of their proposal, in terms of cost they were projecting, that is what basically is at issue between me, my team and the contractor today.

In our Government assessment we do not think that it will take the total required hours projected by Hughes Helicopter which are really cost drivers of the program to build the machine to the specifications that we want.

Mr. AMBROSE. I would like to add a little bit to that, as much as anything out of my prior experience, there seems to have been at least every incentive all around to low-ball numbers. I don't mean

that in any kind of onerous way, just simply to be as optimistic as possible in the Government, and the contractor as well.

Senator WARNER. When did that decision to low-ball take place, at the origin of the contract?

Mr. AMBROSE. I think from the very beginning of the attempt to insert a new program into the system. The incentive there in order to get it adopted for consideration seemed to have had very high pressure to yield optimistic statements as to what it takes to bring that system about.

Senator WARNER. Do you think, in your judgment, the contractors attempted to buy in on this situation?

Mr. AMBROSE. I don't think I would put it in the buy-in sense. I think the Government's budgetary position and its objective design-to-unit cost numbers one way or another are widely known and when you look at the bids that are received and the competitive environment, they are all the same and they are, in my opinion, by no coincidence the same as or slightly less than the Government estimates at that point in time.

What I don't understand is why, with all of this history that apparently has been going on for many years, the Government does not wake up to the fact it would be better off putting in a factor of some kind, even if it is arbitrary, and say we know these things are going to be higher, and look at the program that way.

Certainly, in my mind, when I look at these propositions with all their history behind them, that is what I am going to do, unless somebody can persuade me otherwise.

Senator WARNER. Do you feel as you look back over this contract that you have any legal recourse or leverage to make the contractors adhere to some of their original estimates?

Mr. AMBROSE. If you go back to chart 2, the Government and the contractor are not saying anything very different. The difference you see there is an estimating variation that is easily within the design knowledge of the program, so I can't see any basis for saying that the contractor was any more at fault than the Government. I think they are both, to say the least, very optimistic, if not naive.

My assessment of the Government side of this—and I am not talking, of course, about the Army—is that we need considerably more strength in the production engineering, production tooling kinds of people within the Government in order to properly manage these programs. That is going to be an uphill battle, but we have to get it on our side.

Senator WARNER. Mr. Chairman, I think I have taken sufficient time. I will yield and come back with more questions.

Mr. AMBROSE. Mr. Chairman, may I interrupt? I have just been shown, with respect to your earlier point, a letter that was sent on the 11th of December to Senator Tower from Secretary Marsh that contains the same cost information I have been using here today, to your point about what information was received.

Senator GOLDWATER. Senator Byrd?

AH–64 COST FIGURES

Senator BYRD. I would like to get clear on a few figures, if I may, Mr. Secretary. The information I have is that the cost figures for the AH–64 presented to Congress prior to December 10 put the total cost of the program at $6 billion for 536 aircraft, or a per unit cost of $11.1 million.

Now, are those figures correct?

Mr. AMBROSE. I believe those figures are those that are shown on table 1 column 3.

Senator BYRD. To put it briefly, those figures are correct?

Mr. AMBROSE. Those figures, to the best of our knowledge, were correct at that time at the program manager level.

Senator BYRD. The current informal Army estimate is for a total cost of $7 billion for 446 aircraft, a reduction of 90 aircraft, and a per unit cost of $15.690 million. Are those figures correct?

Mr. AMBROSE. They are correct, but if I may, the $15 million in that series of numbers, the $15.6 million should be compared to $13.2 million, because they are both program acquisition cost numbers. They are the total of all the costs, including the R. & D. and everything else, divided by the number of aircraft, rather than $11.1 million.

The comparable number—again, I refer you to table 1, columns 3 and 6—the comparable number for the $11.1 million is $13.1 million. That is the unit procurement cost.

Senator BYRD. Let me put it another way: Prior to December 10, which is not very long ago, the total cost of this program was put at $6 billion for 536 aircraft. Today the cost is put at $7 billion for 90 aircraft less; is that correct?

Mr. AMBROSE. Yes, that is correct.

Senator BYRD. Now, I think the most significant table you have given the committee today is table No. 2, and you commented on this in your opening remarks, Mr. Secretary, and I think this is a very important table. It shows that in November 1979 the prime contractor estimated that it would require a little over 6,000 hours per aircraft.

LABOR HOURS DOUBLED

Then, in May to September of 1981, the prime contractor more than doubled that figure, to 15,000 hours. Then a few months later the prime contractor almost doubled the figure again, to 24,000 hours.

Now, would you, or would the project manager, explain to the committee just why that would be?

Mr. AMBROSE. I will make an attempt and then let General Browne comment as he wishes.

First, you will notice in November 1979, the Government estimate was 8,354 and it rose in 1981 to 12,914. Now, those numbers, although they sound exact, can't possibly be regarded with that much exactness because they are estimates. The difference between those two numbers, I believe, reflects, reasonably correctly, the failure to take into account in November 1979, or, more precisely, in the interval between November and May of 1981, the actual

growth of design or the realization of design of such componentry as the electrical wiring and other elements of it.

I think there was a mistake made by both the G vernment and the contractor of not recognizing at an earlier time that this airplane inherently had a higher cost designed into it than their estimates based on these kinds of parametric lines of reasoning.

The increase beyond that comes from the prime contractor, I believe, largely reflects a reconsideration, reexamination, by that prime contractor as to what was really going on in his organization in performance.

I don't say that to defend it. I just say that as a fact I believe there is new management, there has been an organizational change; this company was part of the Summa Corporate complex and I think events led to these changes and in the course of that change and recognizing the actual performance in their shops, they revisited the basis for their estimates and found they were actually taking longer to do the work. I am not defending it. I just say that is the other part of the cost.

Senator BYRD. That is not very persuasive to me.

Let me ask you this question: The Government, as I understand your figures, estimated—this is now your December estimate—it would take 12,000 hours. The prime contractor then estimated at the same time it would take double that, 24,000 hours. Somebody is 100 percent off.

Mr. AMBROSE. Absolutely. I have said, in any number of ways, I have tried to say this morning, we are not buying that story from the prime contractor.

Senator BYRD. What are you going to do about it?

Mr. AMBROSE. We are either going to get it down or we will not do business with him. He is noncompetitive. We are not prepared to pay for his noncompetitiveness. We have gotten some movement. You should look at the last column because it refers to the 446, but the 22,325 has come down to 20,800. That is in the right direction but it is not anywhere near enough. He has to get his estimates down to something near ours or he is not going to have a contract.

Senator BYRD. Now, that is a good statement. Let me repeat that statement to see if I understand it correctly: Unless he gets his estimate down very comparable to yours, namely, 12,000 hours, you are not going to give him the contract?

Mr. AMBROSE. If he can show that there are errors in the Government estimate and it should be higher, legitimately, because the Government has failed to do something, we will agree to that. We don't believe there will be much of an increase because of that.

The rest of that, we will not give him a contract for. We just simply won't do it.

Senator BYRD. If you don't give a contract to the prime contractor, where does it leave the program?

Mr. AMBROSE. That leaves the program with the necessity to reprocure the whole business, a very difficult and disagreeable delay, and we are not at all anxious to face it.

We would hope that we can show him the error of his ways, but we simply are not prepared, as I said before, to pay for noncompetitive inefficiency or excessive cost of this kind.

Senator BYRD. That is fine. I am delighted.

Mr. AMBROSE. I don't say that to make a speech about that. That is just our determination. We are not going to do it.

NO BLANK CHECKS

Senator BYRD. I hope that the Army will stand firm on that. Frankly, I think that this committee has an obligation, not just the subcommittee but also the Armed Services Committee, has an obligation to the American taxpayers, not just in this program but in the whole multitude of programs. I don't think we have done our job over the years. That is one reason I am very much inclined for my one vote to be cast against the continuation of this program which is so greatly out of line.

Now, what this committee in the past has done is to have individual members make speeches against the huge cost overruns and then do nothing about it. I think the time has come to let the Pentagon know that there is no blank check and to let the defense contractors know there is no blank check.

I think this committee has a responsibility. I don't think we have fulfilled our responsibility in the past. For that reason, I am very much inclined as an effort to set an example, to state that we are not going to sit idly by and let these programs get way out of hand with the estimates coming in just 2 months apart depicting the tremendous increase in the cost of programs such as this program has had, the cost overruns.

ROLAND PROGRAM

Now, Senator Goldwater and I, the two of us, in 1979, I believe it was, attempted to take such action in regard to the Roland program. We did in subcommittee. I was chairman of the Procurement Subcommittee at that time, but we were defeated in the full committee and we were defeated in the conference committee.

Now, the Roland program short-range air defense missile system, began with a requirement to outfit four Army battalions with a total of 144 systems, plus spare parts, spares for test and training.

We sought to cancel that in 1979 because it had gotten way out of hand in regard to cost and otherwise, but it was extended.

Now, my understanding is—and you can correct me if I am in error—is that in 1983, this fiscal year, the Army will make its last request for funding of this program. The Army will then end up not with four battalions with Rolands but with three battalions and not with 14 systems but with 127 systems.

Now, the committee was told that that program was absolutely essential. Senator Goldwater and I didn't agree. The Congress did, and the Defense Department and the Congress won out, so we ended up now with a program that was deemed absolutely essential which is now being discontinued. Instead of having four Army battalions, we will have three battalions. Instead of having 144 systems, we will have only 27 systems. So, this is not the only program, the one we are talking about this morning is not the only program that has gotten out of hand, not just in the Army but also in all the sevices.

I think the time has come that this committee really means business to set an example and say we are not going to fund this pro-

gram. I am inclined to vote that way. It may be the only vote, but I have cast single votes many times in my Senate career and I have no objection to casting the lone vote on this.

I am encouraged by what you said, Mr. Secretary, that unless they bring these costs down and are able to substantially reduce the man-hours involved, that you won't sign the contract. I think that will be possibly a good solution.

Mr. AMBROSE. First, I hope we will be able to persuade you with proper action and information that in the end we have a program that warrants support and financing. I say, again, we are not going to do the unreasonable things that I see in front of me.

Senator BYRD. You have spent $1.1 billion but you have a total of $7 billion, which means $6 billion more. There is no assurance that I know of that we are not going to have additional cost overruns?

Mr. AMBROSE. That is the important thing for all of us to recognize, that all of these programs, including this one, are largely estimates of true happenings; they are not committed contracts for the most part; they are based, hopefully, on reasonable kinds of information and insight, but they are estimates.

One of the actions that has to be taken is to nail down more of that future in firm contract commitments. That is why it is so important to get to such things as multiyear contracts or to provisions such as you find in the TADS portion of this contract, where there is an upper limit already agreed to, contractually enforceable, for the total buy out of the TADS component.

We are seeking to get as far along that road as we can, so that when we provide these budgetary and programmatic costs they are costs that are enforceable. Costs that are estimates are not enforceable and they are changed by actions of the Congress, by reprograming and budgeting exercises in the Pentagon, and by all sorts of events. They are estimates. That is part of the problem.

We need to nail down what it is we want to buy and nail down a contractor who is willing to supply it at a fair price. That is what we are trying to do.

ESTIMATE OF LABOR HOURS

Senator BYRD. May I ask just one more question? Is the $1 billion increase based on Army's estimates of labor hours, or the contractor's estimate of labor hours?

Mr. AMBROSE. Which numbers are you referring to?

Senator BYRD. The increase in the program cost, is that based on the Army's estimate of labor hours or is it based on the contractor's estimate of labor hours?

Mr. AMBROSE. The ASARC position of November 1981, which is the Army position, is a combination of contractor commitments and Army estimates to which the Army has added, over and above the estimates of the responsible people, the program manager and his associates, $528 million, as a provision against possible further cost increases. It is an estimate.

Senator BYRD. That is not the question I asked.

The question I asked is: The cost of procurement has increased from an SAR in March 1981, of $4.8 billion to $6.5 billion, 536 aircraft in November 1981. That is a $1.7 billion increase. My question

is this: Is that estimate of increase in cost based on the Army's estimate of 12,062 man-hours or is it based on the 19,800 man-hour estimate by the prime contractor, or the 24,000 man-hours estimated by the prime contractor?

Mr. AMBROSE. Excuse me for not understanding. It is based on the 12,000.

Senator BYRD. Based on the 12,000?

Mr. AMBROSE. Yes, sir.

Senator BYRD. So, you will have to hold firm to that 12,000 man-hour figure——

Mr. AMBROSE. Absolutely.

Senator BYRD [continuing]. If you are going to have the program come in at a cost you envision today?

Mr. AMBROSE. That is correct. That is why we put in the $500 million, to allow for some possible underestimating on the part of the Government people. Yes, basically we have to get within that limit in order to hold those numbers.

I repeat, it is an estimate of actions taking place over several future years, including an estimate of the effects of inflation over those years.

Senator BYRD. Thank you.

Senator GOLDWATER. General Browne, as I understand it, nearly 50 percent of this is in electronics?

General BROWNE. Yes, sir.

INFRARED SIGHT

Senator GOLDWATER. From the very first of your work on this, did you have the infrared sight in the aircraft all the time it has been planned and developed?

General BROWNE. No, sir.

Senator GOLDWATER. When did that come in?

General BROWNE. We brought the sight in about 1979. As you recall, Senator Goldwater, we had a competitive program to develop the sight during the second phase of the aircraft's total system development. When we had the first phase; we just had aircraft development, and we picked a winner between Bell and Hughes and selected Hughes.

The second phase began in 1976. Then we embedded in it a competitive development for this very intricate sight system which does these things at night and long range. Martin and Northrop Corp. were the two competitors. We selected them to build that sight. They built prototype articles. We got them in the airplanes in 1978, did testing in 1979, and selected the winner, Martin, in April 1980.

We did not start with this sight at day one. When we first started this airplane it had the old TOW sight on it. We changed that for good and substantive reasons because the new sight had better capabilities, as does the new missile.

Senator GOLDWATER. Do you think that the addition of the infrared sight would add up to this great increase in man-hours for electrical work and wiring?

General BROWNE. There is some of that, but not to the extent there is claimed here. I am the fellow who is fighting with them

over their estimates. I don't agree with them. I don't support them. I don't believe they have substantiating data that would make us change our position yet.

Senator GOLDWATER. I might say, general, this hearing is no reflection on our opinion of your ability. I personally know of the great work you have done on testing this bird. I repeat again it is one hell of a good helicopter. It just costs too much money.

General BROWNE. I got you. I am of the same opinion. I believe if you will talk to my contractors, you will note that I have a reputation for knocking their heads together about cost during the 6 years I have been on the program.

Senator GOLDWATER. We are going to help you.

General BROWNE. Thank you.

Senator GOLDWATER. I might say to Senator Byrd that I am hopeful that this hearing will get the other chairmen excited to the point that we will take up some of these systems that have just sort of gotten out of hand. I am thinking of the main battle tank. It has gone clear over the Moon. All we hear is, well, the engine doesn't work; the transmission doesn't work, and it keeps on not working.

But I want to ask the Secretary, what changes to the Army's acquisition process have been initiated to improve the accuracy of early cost estimates?

Mr. AMBROSE. I found to my complete surprise that the program management and cost control or reporting system in DARCOM, the principal procuring agency, did not contain a requirement for cost estimates to be associated with engineering changes. I just could not believe it.

A new cost control system has been instituted by DARCOM applicable to all of its major programs that requires, among other things, complete inclusion of every single applicable component or supporting efforts such as training, simulators and the like.

It also requires that a cost estimate be made at the time any change is instituted or before it is instituted.

Now, systems by themselves don't get you anywhere. It is discipline and enforcement of these systems that really count. But we have tried to institute the necessary methodology of procurement change to get the cost effectiveness.

One of the problems is that people just plain leave things out. So, we have tried to put a stop to that. The second is that people have been allowed to change something without having to face immediately whether it was cost effective. We have put a stop to that. It is up to us to discipline this system to make it work.

We have put one of the recommendations of this cost committee that you referred to earlier, Senator, into effect, and that is, we have set up a little shop in the Army staff whose sole purpose is to trace the trend of these accounts. The information is there; it just has not been used; it has not been called to the attention of management. Now it is to be called to the attention of management on a prompt basis.

It is this sort of thing—we certainly are not going to make miracles happen with speeches; we are only going to make miracles happen if we get our teeth out and bite on them.

REAL GROWTH IN DEFENSE SPENDING

Senator GOLDWATER. I have another question in relation to that, Mr. Secretary: Even if we achieve real growth in defense spending projected by the administration, there is still a very finite limit on the spending authority available to the Army. If the AH-64 program will now cost $1 billion more than we projected last year, what offset does the Army intend in order to fund this increase? Bear in mind that the cost of other programs have also grown, adding to the budgetary pressure created by the AH-64 cost program.

Mr. AMBROSE. We have gone through at the time the decision was made to program that increase in great detail by fiscal year, by line item; where that money would come from.

The one thing we did not want to do was simply stretch out or drag out some other major program and then pay that bill some other time. I will not support that kind of thing. We have an exact account of every dollar, every fiscal year. It is made up of bits and pieces for the most part that we think we can sustain as reductions without any significant effect on any other major program.

I would prefer not to go through it in that detail at this time, but we can supply such an account for the record, if you wish. It is made up, as I say, of many smaller items, smaller reductions. We have not impacted any other programs, but we have not postponed that day of reckoning to some other time. They had to find the money before we would agree to the increase.

Senator GOLDWATER. We will go into closed session as soon as the members finish their questioning.

Senator Jepsen?

Senator JEPSEN. Following up what Senator Goldwater has asked, I appreciate you don't want to go into detail. Can I ask some questions on where you might make up for this increase in funding for the AH-64?

Do you plan on canceling the SOTAS and a reduction in the Roland air missile program funds?

Mr. AMBROSE. Yes.

Senator JEPSEN. Do you further plan to get some funds from ammunition repricing?

Mr. AMBROSE. Yes.

Senator JEPSEN. Do you further plan to stretch out production of the AH-64 resulting in extreme cost growth and unit cost inefficient production rates but lower cost in the early part of production?

Mr. AMBROSE. I don't believe that is a correct understanding of what we are trying to do. We are actually trying to speed up the production.

Let me say, first, that the production capacity that the Government has paid for in tooling is above the quantities that were planned to be produced. We have tried to increase the rate of production to get more efficient use of those facilities. The limit on our ability to do that in the first 2 or 3 years has been budgetary funding availability in those years.

The consequences of trying to fund the long-lead items and the other work that would lead to a buildup, a more rapid buildup, has

unfortunately been a reduction in the first 2 years. It is followed by a very sharp increase in production rates in the subsequent years.

Senator JEPSEN. Who uncovered the cost increases? That may have been answered, but I have been advised it hasn't. Did the contractor, the program manager, the independent cost analysts?

Mr. AMBROSE. It is all of those. The formal disclosures were in a contract submitted design-to-unit-cost event that occurred in May of last year, and the submission of the contractor's proposals at the end of December last year. Those two steps are charted in the material that I supplied the committee. We did discuss it a little earlier.

Senator JEPSEN. It seems to me that one of the reasons that we have a cost growth not only in the AH–64 program but also in many others as well is that the required systems' capabilities are not carefully formulated prior to initiating the development process. Frequently we see many programs that start with a given set of requirements or capabilities and end up with some additional ones, so that the final weapon system is a combination of many systems that are not easily integrated and thus cost a great deal more money.

TARGET STANDOFF SYSTEM

For example, one such addition to the AH–64 program is the target standoff state: is that an accurate statement?

Mr. AMBROSE. That, I think, in general has been the trend of the programs, whether it is inadequacy or, as I think, they are taking so much time. It is incredible the amount of time that is being used up to bring these systems in. The technology, both on our side and on the other side, drives the inclusion of additional capabilities.

If these things would progress more rapidly and get out of the door, I don't think you would see that kind of problem. I think you would see success.

Senator JEPSEN. Has the problem of adding capability requirements been responsible for the cost growth of the AH–64 program?

Mr. AMBROSE. I tried to answer that at an earlier time, this way: In 1972 dollars, which is the reporting base, it was a $1.9 million airplane on an equivalent basis of today's statement. Today we have a $3-million airplane; the $1.9 million unit has gone to a $3-million unit flyaway cost in 1972 dollars. Of that increase, about $500,000 is due to including added capability and half has been increased cost to rectify mistakes, underestimates and to cure problems that arose in the development. So, those are the relative proportions and then you can translate those into today's dollars or escalated dollars or into any other framework you wish.

HELLFIRE LASER-GUIDED ANTITANK MISSILE

Senator JEPSEN. The Hellfire laser-guided antitank missile will be the main antitank weapon on the AH–64; therefore, they are closely linked. The Hellfire is also in the developmental stage. An internal Army board, the Army Systems Acquisition Review Council, has recommended program production quantities be increased to 35,756 missiles even though the AH–64 production will be reduced.

I have several questions following that up.

Why are the quantities being increased for the Hellfire?

Mr. AMBROSE. General Vessey, do you want to respond to that?

General VESSEY. It is my recollection that the quantities were increased because of the battlefield need for the system; that is, the missiles on the battlefield, the targets. We are also examining the use of the Hellfire by means other than the AH-64, although we have not agreed to do that in this case.

The Hellfire is a very capable missile and it is believed that its contribution on the battlefield makes that sensible.

[Added information follows:]

General VESSEY. Hellfire missile procurement objective (PO) has been increased to 35,756 because the battlefield need has increased. Missile requirements are a result of simulations of a European scenario fought over a 180-day period. The figure of 35,756 is the approximate number of missiles needed to equip the AH-64 helicopters that will be in the field by end fiscal year 1988.

Senator JEPSEN. This is the Army's authorized acquisition objective; is that what you are saying?

General VESSEY. That is the authorized acquisition objective.

Senator JEPSEN. We don't know how that quantity was determined?

Mr. AMBROSE. Perhaps it would be better to supply that information for the record.

Senator JEPSEN. In closed session?

Mr. AMBROSE. Not so much in closed session, although there is some classification, but in writing, so that there is no confusion.

Senator JEPSEN. Can you answer this generally. Why is the Hellfire procurement not being accelerated in the manner similar to AH-64, since both programs have been managed on similar schedules at this time?

General BROWNE. They are in synchronization, sir. In fact, the Army made the decision to sort of link, if you will, the Hellfire with the AH-64 long ago. We went to a common ASARC; we plan to go to a common DSARC. The planned procurement quantities are based on a basic load for x number of missiles—which is perhaps confidential; I can tell you in closed session—per airplane.

In addition to that, we have a training requirement of y number of missiles for training base as we train our aviators and copilot/gunners. Then there is some—I understand, and we will talk about that in closed session—for war reserve.

Senator JEPSEN. Did you expect any significant cost increases in this program?

General BROWNE. To my knowledge, sir—and we do have the Hellfire project manager with us—I know of no additional increased cost exposure in the Hellfire.

Senator GOLDWATER. Senator Thurmond, do you have a statement you wish to make?

Senator THURMOND. Very briefly, Mr. Chairman.

Mr. Secretary, I will always support the helicopter. I think it is a very valuable weapon. I am very interested in it; however, the cost growth I notice in Ootober 1981 is $13.2 million; in November 1981, $15.6 million. I did not hear your whole testimony. Can you explain that tremendous surge in cost?

Mr. AMBROSE. I hope so, Senator. We, first of all, said we don't agree with and won't accept the present contractor's proposals.

The second is that we believe that the cost increase that occurred prior to that is a combination of belated disclosure, if you will, of costs that had been in there all along, particularly in certain parts of the airframe, wiring and the like, belated in the sense that under the methods of reporting that were existing over that period of time the total was not wrapped up until the May period of 1981.

We also believe that in that period there were changes in the prime contractor's management and workforce that have disclosed to him that he was simply not taking into account the actual work experience.

We are not prepared to support all of that either, but that accounts at least for some part of his increase in his estimates.

You will notice in table 2, particularly between November 1979, and May 1981, both the Government and the contractor went up very substantially. I think it is in that period they both woke up to the fact that they had costs in this airplane they had not been counting.

KEEPING A STRONG DEFENSE

Senator THURMOND. We must keep a strong defense. I have always supported a strong defense and I want to keep on doing it. We want to carry the public opinion along with us because public support will control our actions. We must keep these costs reasonable.

I hope the contractors realize, too, that we have to do this, otherwise, we won't be able to get these programs through the Congress. The public has got to understand that what we do is reasonable, is necessary and is fair.

I hope you will exert every effort you can to see that that is carried out.

Mr. AMBROSE. If I may indulge in a personal statement, I came out of retirement to take this post, not because it was a fun thing but because I thought I could help with some of the problems I perceived. I am not about to support while I am there the kinds of things that apparently have gone on for some time. How much I can do about it in a short time, I don't know, but I assure you I will do everything I can.

The message has got to go to both the Government and the contractor. It is not purely a contractor-driven problem. There are underestimates in the beginning of these programs. They are taking too long; too many things are being asked for us to contain and I am sure I am not telling you things you have not considered yourselves many times.

Those are the things that have to be worked on. I find this is the situation that has accumulated over a large number of years. Trying to fix these things in the middle is not a very easy task, but I will do everything I can to help out. I completely agree with you; the Army in particular needs so many things so urgently that it can't possibly dissipate its limited resources in unwarranted and unlimited growth in particular programs.

Senator THURMOND. Thank you.

Thank you, Mr. Chairman.

Senator WARNER. Mr. Chairman, I will just take a few more moments.

With no personal reflection on the witnesses today, this is the worst case we could have started off with on the 1983 budget, when the President and the Secretary of Defense are coming up here on Monday asking for an enormous increase in defense spending. I regret to say that I would not say this if I had not sat in your chair for over 5 years, Mr. Ambrose, that much of the testimony given today sounds like an old, broken record.

When we come up here and say that the problem is rooted in poor methodology, faulty reporting systems, that just is an incredible indictment of the Department of Defense and its inablity to manage a major procurement. We cannot accept that as the answer, at least I cannot.

Furthermore, I am afraid I have to disagree with perhaps some sentiments expressed here this morning that maybe since this is such a bad case we have to cancel it.

COMPARABLE HELICOPTER BUILT BY SOVIET UNION

My research shows that the Soviet Union produces a comparable helicopter to the AH-64. Is that correct?

Mr. AMBROSE. Yes.

Senator WARNER. Although that helicopter may not be as good a nightfighter as this one, it certainly is going into their inventory and supplying them with the capability we cannot deny the fighting men of the U.S. Army and the defense of this country.

So, it seems to me, the obligation falls on you, working with the committee, to correct this situation and get on and produce this helicopter and at the same time not degrade its military capability; in other words, strip it down to save a few bucks here and there.

General Browne, how many people do you have working with the contractor on a daily basis right in the plant?

General BROWNE. In the plant from my office I have none there on a permanent basis.

Senator WARNER. What is the number?

General BROWNE. I have none from my program office that are in residence at the contractor's site. There is a plant activity run by the Army, by the Aviation Research and Development Command that monitors all Government contracts in that facility. I do use those folks to assist me in looking into cost aggregations. They have helped me find and defend the numbers I am talking about in our estimate of 12,000 hours, as an example.

Senator WARNER. How many people are up there?

General BROWNE. There are about 60 people there, but they cover all Government efforts in that plant.

Senator WARNER. Were they part of this faulty methodology and faulty reporting system?

General BROWNE. Let me say it this way, Senator: The contractor has on this program several thousand people, 330 work package elements in the work breakdown structure. There is no way with the resources allocated to us that we can put a one-on-one situation. We have to take and sample and try to understand and re-

quire from him his cost reporting system and analyze that. In essence, that does cause us a program in delays in getting good information on a timely basis.

Senator WARNER. We are paying for all those thousands of people the contractor has. Is he overwhelming you with people?

General BROWNE. No, sir. It takes that number of people to do the things he has to do.

The reporting system we use in terms of getting his cost on the cost schedule reporting system gives us a report monthly as to how those costs are aggregating.

Senator WARNER. Mr. Chairman, I have taken more than my time.

General BROWNE. As I said earlier, I think the Government does, in fact, need increased strength on its side, particularly in people knowledgeable of production processes and the like, not so much financial types but people who actually understand what it takes to build this stuff. That is not just peculiar to this program.

It does not make any sense to have weakness on one side of what should be an evenhanded situation.

SOVIET HELICOPTER

Senator WARNER. General Vessey, before we close out this public record, why don't you comment on that Soviet helicopter? The information I have is that they will have many of those units in inventory before the first one of these units is delivered to the U.S. Army. That should impress upon our colleagues the need for this particular piece of equipment in our inventory.

General VESSEY. Your estimate is about the same as mine. It is a good helicopter; it is not as good as the demonstrated capability of the one we are trying to field here.

The Soviets learned from us about the use of helicopters on the battlefield, particularly the use of attack helicopters. They were able to get one in production much faster than we were and the fielding of it.

Ours will be better; it is more survivable; it has a better missile system; it has night-fighting capability; it will provide us a tremendous capability on the battlefield.

Senator GOLDWATER. Gentlemen, as I announced earlier, I do have a court case in New York and I have to leave. I will turn the subcommittee over to Senator Warner and shortly we will go into closed session.

Before I go, I want to thank you for coming. I want you to do all you can to get this helicopter straightened out. I promise you, we are not just going to buy at any price so that you can have a helicopter. If you get the price down, we can buy it. I am not just worried about what it is today. I am also worried about the next year and the year after that and the year after that.

The first thing we know, we will have a helicopter equipped like our single-seat fighter plane that is now up to $40 million. We are not going to build any force structure at those prices.

Thank you for being here.

Mr. AMBROSE. Thank you, Senator Goldwater. We are in complete agreement.

Senator WARNER [presiding]. Senator Cannon?

COST EFFECTIVENESS OF THE AH-64

Senator CANNON. What studies have been performed to assess the cost effectiveness of the AH-64 since the program cost increase over the level of the March 1981, SAR estimate became known?

General VESSEY. We have updated the cost and operational effectiveness using the new cost, Senator. The helicopter continues to be cost effective.

Senator CANNON. Is that what the study results show, that it is cost effective?

General VESSEY. That is correct.

Senator CANNON. In relation to your new figures?

General VESSEY. That is correct.

Senator CANNON. What were the alternatives to the AH-64 used to determine the relative cost effectiveness in these studies?

General VESSEY. We used the AH-1S as the baseline for comparison. That is our fully modernized present attack helicopter armed with the TOW missile system.

Now, the basis for comparison in the latest cost and operational effectiveness analysis, we made a paper airplane taking the Cobra AH-1S and upgraded it and gave it a night capability with the FLIR capability for target acquisition, not the pilot's night vision devices, because we could not see how we could add that much weight to the Cobra.

In addition, we have also considered it with another engine, a new rotor system and considerably improved it with the best cost estimate we could give for that improvement, and the AH-64 is still a superior helicopter.

Senator CANNON. So the AH-64 with that upgraded capability of the Cobra still came out in favor of the AH-64 from a cost effectiveness standpoint?

General VESSEY. Yes, clearly.

Senator CANNON. When you say "clearly", do you have any factors you can give us?

General VESSEY. I guess you could say—and these are estimates, rough estimates—but one would say that if the AH-64 cost again half as much as the present costs, which we think are far too high for the helicopter itself, it would still be cost effective on the battlefield with the capability it has.

Senator CANNON. If it cost half again as much, it would still be more cost effective than the upgraded Cobra?

General VESSEY. That is right.

Senator CANNON. Thank you.

Senator WARNER. Gentlemen, are there any further questions in open session?

Senator BYRD. Let me ask one question.

General, I have been informed that beginning in mid-1979 the contractor was required by the Army to make, and did indeed make, quarterly reports of estimated cost increases and that costs were reported as they were experiencing them. Is that correct?

General BROWNE. Senator Byrd, the contractor is required to report quarterly all his costs to us, but no special reports, to my

knowledge, were identified for cost increases solely. That is a standard cost performance report that he submits to us by contract. We have all of those and those are part of the information that caused us to sound the alarm that costs looked like they were going up.

Senator BYRD. They sounded the alarm, as I understand it, toward the end of 1981?

General BROWNE. No, sir. You will find that as you look at the design to cost that was on the chart in table 2, you will see in November 1979, we did report an increased cost over what we had formerly; but we did not have at that point in time the information that led to that great rise when we had the May–September update in 1981.

Senator BYRD. So, the report you got did not give you the cost overrun information?

General BROWNE. That is right, sir.

Senator BYRD. Why don't you ask for that? Why don't you make that part of the report?

General BROWNE. There is the support, the cost reports are supposed to support cost increases as they occur. We did not see all of those in those reports. In fact, when we held our design-to-cost review, Senator, for all of the pieces of the airplane that we have in a recurring manner that support the flyaway weapon system——

Senator BYRD. If the report is inadequate, why don't you require more adequate reports?

General BROWNE. The problem is that the visibility into the aggregation of those costs as you are in development and physically making changes just does not give us as good visibility for production as we need.

Mr. AMBROSE. If I can interrupt, we are not satisifed with the timeliness of these reports. There are limits as to how often you can reconsider the entirety of something, but we are going to do more than you see on this date. We are not going to accept that as adequate timeliness.

Senator BYRD. Thank you.

General WARNER. At this time I ask the committee clerk to clear the room, such that we can go into executive session, and to inform the Chair when we are prepared to go forward.

[Whereupon, at 11 a.m., the subcommittee proceeded in executive session.]

EXECUTIVE SESSION

Senator WARNER. I want assurance from the clerk of the committee that the room is cleared.

I am informed by the clerk that this room now has been cleared such that we can receive classified information, Mr. Secretary.

SAR COST ESTIMATE

Mr. AMBROSE. I was going to make one further comment that ought to be in the open record that we just simply overlooked. That is, that the cost estimating that is referred to as the SAR cost estimate is fully supported by the OSD cost estimating committee as

well. It is not a matter that they are sitting there thinking there is some higher cost. That is not a classified item.

Senator WARNER. The purpose of the closed session is to avail the Department of the Army with the opportunity to come forward and supplement the record with such information as they feel is important to substantiate the positions that you have expressed today and to perhaps amplify the corrective measures you intend to take.

I will lead off with one question and then quickly defer to my colleagues.

Let us be very frank on this program. There is concern with the financial wherewithal of Hughes to satisfy the Army's program requirements that subject the taxpayers to the enormous cost escalation that we have discussed today. I am aware, or at least I am informed, that Hughes may be reluctant to share with Department of Defense representatives certain internal proprietary information in connection with a DCAA audit; however, in view of these cost increases testified to today, this has become a high visibility program and will have to withstand further scrutiny at a time of a growing consensus that significant reductions in defense spending should be achieved.

You may be assured the Congress will not be the only entity looking at this program closely.

It seems to me the following should be done: One, a thorough audit of the financial stability of Hughes Helicopter, Inc., which addresses the ability of Hughes to satisfy the existing and projected contractual commitments on this program as well as any other defense programs; and, two, a letter from the Secretary of Defense indicating that he is confident that Hughes can indeed carry out the program which the Department of the Army currently proposes today.

DCAA AUDIT

Now, would you care to comment on, first, the DCAA audit? Is it underway and are they encountering difficulty in gaining needed information from the contractor?

Mr. AMBROSE. The DCAA audit is not only underway but also we have a report from them. I have not been informed that they have had any difficulty of the kind you are referring to with respect to the financial stability of the company, and I will comment on that separately.

I don't know whether you were present when I said I regard the report as unacceptable and we are not going to go into a contract until we have an acceptable audit report; but that referred to their information provided to us with respect to their cost estimating basis for the proposal, not with respect to financial stability of the company.

General Browne, is there any audit report that you are aware of?

General BROWNE. No, sir. I think that sums it up very well. We have had at times a lack of timely data, but we have not had a hard-lining, if you will, or stonewalling by the contractor to give us the data that we have requested. Sometimes it has come later than we would have liked.

Mr. AMBROSE. With respect to the financial state of the company, Hughes, Inc., is a privately held company. I believe it is still a subsidiary of the SUMMA Corp. There has been a structural reorganization that has been going on for some time.

I received on a personal, private basis a day or so ago—and I have had just a relatively short time to look at the information provided on that basis——

Senator WARNER. We appreciate that, Mr. Secretary.

Mr. AMBROSE [continuing]. Enough information that I believe it is possible to provide eventually an analysis and assurance, if one is warranted. I am not prepared to give it to you today.

Senator WARNER. We have a different set of facts with respect to the intercorporate relationships with SUMMA. I will ask Mr. McGovern to outline those facts and ask further questions.

Mr. MCGOVERN. Mr. Secretary, we are concerned with an audit dated September 18, 1981, which was conducted by the Defense Contract Audit Agency. Hopefully you will have an opportunity to read this report because it indicated DCAA's concern about the financial stability of Hughes Helicopter, Inc. We want to be assured that DCAA has had an opportunity to look at such things as—Hughes Helicopter, Inc., financial statements, board of directors meetings minutes, internal audit reports, lending agreements, et cetera, those kinds of things that would indicate the financial stability of the company, particularly with respect to the AH–64 program.

We are aware of, or at least are advised, that perhaps Hughes has been operating at a loss for a number of years. There would be nothing worse, of course, than to have Hughes be unable to fulfill its contractual commitments because of this problem.

There has been a recent reorganization which has caused the DCAA to ask why that was done. I know that some of Hughes' responses to that do not satisfy the committee.

What we are simply asking is that the Department of Defense conduct a thorough audit of Hughes as a corporate entity to insure that they are financially able to meet all of their contractual commitments, not only on the AH–64 helicopter but also on other defense-related programs. We would also like the Secretary of Defense to provide the committee with a letter, after having done that audit, stating that he is reasonably confident that Hughes can meet these contractual commitments.

We would like as well to have the DCAA staff meet with me to go over some of the specific issues that should be included in this audit which we would like them to conduct.

Mr. AMBROSE. We will do both. I am familiar with the September letter. I thought that had been cleared by subsequent information and action. I am surprised to hear that it is not. But we will straighten that out.

The information I have received is yearend; it is quite complete; it is internal documentation, but I don't feel entitled to discuss it here. It will be analyzed as to their net worth, their financial performance over time and the like as to subordinated loans and all the rest of it.

After the September letter that you referred to, I met with Mr. Real, the president, and others, and discussed these very questions

that you are asking. I believe that I had satisfaction, had it at the time, but to make sure I had, I asked for and I have just received the complete package and it will be gone through in a way that will protect the privacy rights of any privately held company, but the Government's right, even more so, which as far as I am concerned is paramount.

We will meet with you and we will get the Secretary of Defense's letter.

Senator WARNER. Thank you, Mr. Secretary.

Senator Cannon?

Senator CANNON. Thank you, Mr. Chairman.

PILOT NIGHT-VISION SYSTEM

General, on that cost-effectiveness study that we talked about a little earlier, did you look at the upgrading and giving the pilot night-vision capability?

General VESSEY. We did not put the pilot night vision into the AH-1S. We gave it the FACTS [FLIR-augmented Cobra TOW sight] but left it with the improved night-vision goggles. We did not give it the pilot night-vision system that is on the AH-64 because we did not think it would carry it. It is too heavy.

Senator CANNON. Has the company proposed a variant of the pilot night-vision system?

General VESSEY. I will ask General Merryman to answer that question.

General MERRYMAN. Which company, sir? Are you referring to Bell?

Senator CANNON. Bell, yes.

General MERRYMAN. I am not sure if they have.

Mr. AMBROSE. I was told a few days ago that a proposal of the general thought you are talking about had been submitted to some of the European governments, but not to the U.S. Government so far as I can find. I have asked the people to find out what it amounts to.

Senator CANNON. Are you reasonably comfortable with this cost effectiveness comparison that has been performed so far?

General VESSEY. We are. I think we have a good cost and operational effectiveness analysis. We went over it very thoroughly here recently. It is clear that the AH-64 is the best choice.

Senator CANNON. What made the biggest differences in the cost analysis effectiveness study?

General VESSEY. The FLIR night and adverse weather capability; it still has a better night capability than the limited night capability of the improved TOW. Then the range of the missile gives it far better capability. It has increased standoff range; superior, faster time of flight of the missile; increased lethality of the missile warhead and the opportunity for multiple engagements; and you still have some growth potential.

Whereas, despite all that we did with the paper Cobra, we have done about all we can do with that.

Senator CANNON. What was the difference in standoff range between the Cobra—with the TOW and the Hellfire?

General VESSEY. Well, of course, the missile range is 3.7 kilometers with the improved TOW, and a demonstrated direct fire capability of [deleted] kilometers with the Hellfire.

Mr. AMBROSE. I reviewed at Martin Marietta just a few days ago the technical opportunities that are not yet incorporated in the TADS design that would increase the range. It appeared to be on solid ground. Although they are not yet in the program, there is reason to expect they will provide some of this comfort that we are talking about. They keep getting further away with that sight.

AH–64 SELF-DEPLOYMENT CAPABILITY

General VESSEY. Another point is self-deployment capability of the AH–64. It has a capability of traveling 800 nautical miles by itself. We don't see any way of getting anywhere near that with the improved Cobra.

Senator CANNON. Is there any other information that you haven't given us up to this point that you think we ought to have in this closed session?

General MERRYMAN. Another thing on the COEA and OT–II results that should be pointed out is that with the greater range you have with the missile, of course you are able to engage the enemy before he gets in close enough to do anything to you, so your losses of the AH–64 are significantly less than they are with the AH–1 Cobra.

General VESSEY. I would point out that the operational test was a very good test. We have learned a lot about not only the capabilities of the aircraft but also the capabilities of our ability to train people to use it.

We did in retrospect what may have been a dumb thing, or might have been a smart thing. We took attack helicopter pilots in the closest helicopter attack company to the proving ground range and said we would use them in order to save money. It turns out that unit didn't have an antitank capability; it was just a G model Cobra company. The pilots that came out of it were not familiar with the attack helicopter antitank tactics but we did have a broad range of talent among those pilots, and I guess—what did you have, about 45 hours of training for each one of those?

General BROWNE. Yes.

General VESSEY. In 45 hours of training they performed very well. I went out and looked at that test and the helicopter and tactics evolving made it very clear that this thing will make one of the most substantial additions of anything I can think of on the battlefield if we can buy it for the right price.

Senator CANNON. Why in the SAR was the current estimate of maximum range only [deleted] if you say [deleted] in the study?

General VESSEY. We did not use [deleted]. I misspoke. The maximum range is [deleted] for the missile for the direct fire. Now indirect fire is [deleted].

General MERRYMAN. What you have is the capability. If you are shooting direct fire with this thing you are talking around [deleted] but you have the capability to shoot indirect fire and have a laser from another designator on target, and then you have the ability to shoot [deleted] kilometers.

COBRA/AH-64 DIFFERENCES

If I might add, I have examples of the things that I think you are interested in as to what the differences were between the Cobra and the AH-64 that we found in OT-II and COEA, if I might give them to you.

For example, we found that the kill rate of the AH-64 was [deleted] percent greater. This is OT-II. We found that it was able to engage at ranges nearly [deleted] as far [deleted] as a result of what I just told you.

We found that it had negligible combat losses. We found it had comparable night kill rates as it did day rate, and that was one of the more significant things we found. While the AH-1 was unable to engage targets successfully at night. If you had taken this and put it somewhere else in the world and changed the density, altitude, and conditions under which it performed, those numbers would have been even greater because the AH-64 would have been able to fly, when on some days the Cobra would not have been.

In the COEA, we found that the AH-64 had [deleted] percent advantage in force contribution relative to the AH-1, and we found overall that for an [deleted] percent increase in force costs that the AH-64 improves force effectiveness by [deleted] percent.

To put it another way, with [deleted] percent increase in money you get [deleted] increase in capability.

Senator CANNON. Thank you, Mr. Chairman.

Mr. AMBROSE. I would like to go back to the question as it relates to the cost increases and the question of the financial status of this company for the moment.

COST INCREASES AND FINANCIAL STATUS

In this period from November 1979, to last year, as you know the company was reorganized or went through the processes of reorganization and recognized that its performance financially was not good, brought in new management, changed, I guess, all but one of the present vice presidents.

These people went through the place and revised virtually all of the estimates that had been previously used.

Now, our problem has got to be to sort out, and is, to sort out what is real in there and what is safe-siding it, if you will, to rectify whatever position they have had previously.

On the other hand, I don't believe the Government has any basis for entering into contracts that are beyond the competitive range; otherwise you are just subsidizing this company.

I am not going to support that. That is more easily said than done, because the records are not that great and it has taken General Browne and his people and the DCAA audits an awful lot of work to get into all of this and find out for themselves what truly goes with a reasonable industry cost to do this work and what is overkill, if you will, in trying to correct the past. We are all very sensitive to that and we are going to go through it very thoroughly before we accept the final result.

An example of this, to perhaps illustrate it, is this huge increase in the cost of electrical wiring. We have gone out and done our own producibility studies, gotten with the manufacturers of wire prepa-

ration equipment, talked to other helicopter providers and the like, and we find this is out of line. We are going to get them into line or we will subcontract the work to others, or we will take the work away from them.

There is no basis that I can see for defending increases that are in the noncompetitive range.

Senator WARNER. We are going to let you amplify the record with additional responses.

I want to make certain, General Vessey, that this record is very strong on the need for this particular weapon system in the U.S. Army, because, as was expressed here by at least one of our colleagues, there could be some thought that this is a wonderful example to decapitate but I don't think that will help our national defense posture.

There is a human error here in cost reporting, but human success in producing an instrument which, I understand, is extraordinarily capable, as Senator Goldwater expressed to the project manager.

I have to go to another hearing, as I am sure Senator Cannon does. Will you submit additional information for the record that there is absolute necessity for this system?

[The information follows:]

General VESSEY. The United States today faces a potential enemy that will both outnumber us and is armed with equipment as good as or better than our own. To deter war, we must be ready to counter this threat anywhere in the world where United States interests are at risk.

We need balanced forces to insure success in any conflict; forces capable of conducting battle 24 hours a day, and under adverse weather conditions. The AH-64 Apache is specifically designed to complement our M1 tanks and our M2 Infantry Fighting Vehicles with its survivability, mobility, and lethal firepower. When we talk about survivability, of course, we are not only talking about aircraft survivability, but also of the crew. Soldiers must have confidence in their equipment. The Apache was designed from the "ground up" to fight, and survive to fight another day.

A significant advantage of the Apache lies in its ability to self-deploy to Europe and then on to the Mid-East, if necessary. It is ideal for use as a part of the Rapid Deployment Forces. In fact, the Apache may be the only highly mobile, long range tank killer that will be immediately available to our early deployed light forces.

Since we started the Apache program in 1972, we have continually reviewed our requirements, made fixes where appropriate, and examined all reasonable alternatives. These efforts, as well as those of the office of the Secretary of Defense, have surfaced no other cost effective alternative. These reviews also show that the AH-64 has better potential for product improvement and growth than any alternative candidate.

Last summer, we conducted operational testing, the last of our field trials. The Apache again demonstrated its capability to fight day or night, and was clearly superior to the modernized Cobra against which it was measured. More importantly, we showed that soldiers could fight and maintain it. It is probably the most tested aircraft in the Army's history. It is not a paper airplane, but rather a demonstrated, capable system.

The Army needs the Apache with its superior mobility, employment flexibility, survivability, and firepower. With these qualities, and its superior ability to see the battlefield, it will function as a combat multiplier for the combined arms teams in Europe and elsewhere. There is no other system that can perform as well as or as cost effectively.

In my judgment, the Apache is the most effective and efficient attack helicopter in the world today and, in combination with the Cobra, is essential for success on the highly lethal and sophisticated battlefield we face.

General VESSEY. We have swallowed within our budget these tremendous cost increases, painful as they were, simply because we

believe in the importance of this thing and its contribution to our success on the battlefield.

Senator WARNER. Hopefully, you can put a considerable amount of it in the open.

One more point. Did you say the Soviets will have an inventory of close to [deleted]. HIND's?

General VESSEY. That is right. There are close to [deleted]. They also have a significant fleet of armed HIP's, which also have a great capability. We estimate—and this is a classified figure—that they have [deleted] now operational, close to [deleted] HIP's, and close to [deleted] HIND's.

Senator WARNER. General Browne, I was always of the theory that we should have contracting officers stay for a period of time. I would hope that you are able to provide the Department of Defense as a whole with the benefit of your knowledge, having managed this program, to obviate further situations like this.

How many project managers are there that have 6 years throughout DOD? Very few. I think the Trident system has had one man for some time.

General BROWNE. Senator Warner, I don't know any with that tenure that we have aboard. This is my fifth program for the Army. I have been a project manager since 1968.

Senator WARNER. You know the business.

COST ESTIMATES

General BROWNE. I would like to say something with respect to that, and in all sincerity it was not to lay the blame on our methodologies or whatever. We have a serious problem in the sense that we all have to be able to forecast with greater clarity than any data base that is in existence today allows us.

I don't profess to have the answer to it. I am saying that our estimating techniques have got to somehow get better or we will continue to have these kinds of misestimates.

The biggest problem I have is that we in the Army are all resource driven. The kind of folks, if I had my personal way, that I would have aboard would be a lot more producibility industrial engineers, so that as I go through the design I can better cost estimate what it is when I have to matriculate it to production.

All the estimates we do today in the development phase—like Senator Byrd was discussing, "Why didn't you see this in those cost reports that come in to you?"—the cost reports are those against development. The design to cost reviews are those estimating pieces we are trying to do to leap forward and project what the production is going to be. But the first time that we really see a production estimate in its totality for all of the nuts and bolts and the industrial facilities, tooling, and all the things that have to go with it, is within the last year of the development, and as you get ready to go into that production proposal, the contractor now has a defined object and he either has to make it, and bet his company on doing it at a profit or sustain the loss. And, I submit to you that is why you see cost increases across the board, not just in this program; I think if you take almost any major program, you will find

in the year that you are going to go to production that costs jump dramatically.

What I attempted to do for the committee and, as I told the congressional folks back in June, I was going to try to give you that insight before we went to contract, and that is what we are doing. Rather than go into a contract and at year end, similar to the Blackhawk, find out we had a terrible cost problem on our hands, and have to cut half of them and jump the cost.

I think the Army has done that in this instance. We have provided you visibility before the contract instead of after the fact, tortuous as it was, and perhaps slower than you would like, but we gave you the information when we got it.

Senator WARNER. That is a very important statement because one of the underlying issues, as I understand, before this hearing was the timeliness of the relation to the Congress of your knowledge.

General VESSEY. One other thing I would like to say about those cost estimates—when you look at General Browne's estimates and you see the escalation throughout the years, the best estimators we have in the Army always confirm those estimates and the Defense Department's best estimators confirm the same estimates. It is not as though the mistakes were made in the program office and then hidden away from everyone else. Others have confirmed it.

In this month's Fortune there is an article about doing business in the American automobile industry. There is a quote from a Harvard Ph. D. who is supposed to be an expert in costs. He points out the great problem of the American automobile industry is that there is a lot we don't know about cost control. I would echo that. That is true for us.

Mr. AMBROSE. Without criticizing any of our hard-working people such as General Browne and all of his associates, there is an imbalance, in my opinion. I come in from the other side of this, with no prejudices one way or the other about it. The personnel actions that apparently lie on the Government side, ceilings with people, limits on pay, various other things, I don't have to recite to you, are a serious handicap in getting an adequate balance on the Government side of this thing.

Senator WARNER. How do we solve this? NFL rules? Only so many players on the field at one time?

Mr. AMBROSE. I don't have the answer. We certainly will do everything we can within the existing rules; where we see opportunity to change those rules. The dichotomy, to me, is that we say, for example, we will only pay so much money to the Government specialist. He goes over to the other side of the fence and we enter into a contract with that company and pay him considerably more money out of the same taxpayer's pocket.

Senator WARNER. We have been all through that. We have to save this machine for the country and take our lumps along the way and learn our lesson.

Anything further?

Counsel to the committee will submit whatever additional questions members may desire for the record.

Thank you.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR BARRY GOLDWATER

CONTRACTORS ESTIMATES FOR ELECTRICAL WORK

Senator GOLDWATER. If the contractor's estimates for the electrical work and the integration costs have been unsatisfactory, what confidence do you have that they will be capable of building this helicopter at any predictable cost?

General BROWNE. The example which has been given of differences between the contractor estimate for electrical work and integration cost and the government's should-cost, initial position reflects early results of fact-finding. The Army is confident that Hughes Helicopter can produce the helicopter on schedule and that the final cost position, based upon industry-wide experience for manufacture of comparable items should be achievable by the management of Hughes Helicopters.

Senator GOLDWATER. If the Congress endorses the Army's plan to procure the AH-64, the contractor will earn his profit and the Army will get the helicopters it desires. Who then pays for the mismanagement of the cost of the program? Apparently neither the Army nor the contractor.

Who pays? Only the taxpayer—for he will now be asked to pay considerably more for significantly less.

I want to know what can be done to reduce the cost of this helicopter.

General BROWNE. The Army is conducting hard negotiations with the contractors and will procure the AH-64 at the lowest possible cost. Beyond this effort, procedural alternatives for reducing the unit cost of the helicopter have been considered. Two alternatives for reducing unit costs are immediately apparent: (1) increase procurement quantity; and (2) increase the production rate to an optimum of 15 per month, thereby reducing total program costs. For example, a combination of the two alternatives is a procurement objective of 536 AH-64s at the most economical rate of 15 per month which reduces the average procurement unit cost by approximately $1 million. If the Army were given additional funds in the appropriate years, this program would be achievable.

Also, as previously discussed, selection of second sources for components is feasible and is being pursued.

The AH-64 is being considered for multiyear procurement beginning in fiscal year 1984 at the earliest with possible savings of up to 9 per cent.

The above options will allow unit cost savings while fielding the AH-64 with its unique and vital capabilities for the modernization of the Army combat team. Any reduction of capability of sufficient magnitude to noticeably reduce cost would degrade battlefield effectiveness and prevent the Army from achieving its necessary modernization goals.

MESA FACILITY COSTS

Senator GOLDWATER. What will it cost to build the Mesa production facility?

General BROWNE. Hughes Helicopters management has stated that, including 200 acres of land, it will cost approximately $45 to $46 million.

Senator GOLDWATER. What arrangements does Hughes plan to finance this facility?

General BROWNE. The general plan is to build the facility, sell it, and then lease it.

Senator GOLDWATER. What definitive plans have been made for the sale and leaseback of this facility?

General BROWNE. As yet, Hughes Helicopters has not defined its plans for the Army but has Merrill Lynch under retainer to advise them regarding the kind of arrangements which are appropriate for this situation.

Senator GOLDWATER. Has a marketing study of the feasibility of this sale been performed?

General BROWNE. A marketing study has not been done as none has been deemed necessary. Hughes Helicopters has had numerous unsolicited contacts by parties interested in providing financing for the facility.

Senator GOLDWATER. What would be the impact on Hughes' cash flow if they were unable to sell the facility as planned?

General BROWNE. In this case, the $45 to $46 million cost would become a permanent, capital investment for Hughes Helicopters to be funded by either increased long-term financing or additional equity. The Hughes Helicopters cash flow situation would remain stable under either of these contingencies.

RISKS ASSIGNED BY ARMY

Senator GOLDWATER. What level of risk does the Army assign to establishing this production facility?

General BROWNE. The Army Production Readiness Review in August 1981 assessed the construction risk as "medium", i.e. a tight but achievable schedule. Since that date, we have continued to monitor Hughes' status and have had an independent review conducted by the Corps of Engineers which verified the schedule assessment. Currently all Hughes efforts are on schedule to meet the planned date for initiation of construction.

The Army considers the financing risk to be low. No formal arrangements have been made to date, however, a form of build/lease arrangement is being considered as a financing vehicle. The investment banking firm of Merrill Lynch is under retainer to the company and is providing advice on several different types of financing arrangements. Hughes Helicopter Incorporated (HHI) may select one or more of the Merrill Lynch proposals and go forward on that basis or may make direct contact with the investment community through line-of-credit banks and independent contacts with investors. HHI has had numerous unsolicited contacts by parties interested in providing financing for the facility even though they have no announcement of their intentions.

The Production Readiness Review assessed hiring of skilled labor as "medium" risk, and we have no reason to change our assessment at this time. HHI has conducted detailed studies of manpower requirements for Mesa including surveys of special skills required for production as well as hiring rates required to support manpower goals. HHI has also identified those job skills which will require training and is currently developing training plans with local educational institutions at Mesa.

In July 1981 HHI announced that the final assembly of the AH-64A would be in Mesa, AZ. Prior to that, HHI hired an independent consultant to conduct a manpower survey of the Mesa area. The general conclusion of this survey was that manpower in the skills and quantity required is available in the Mesa area. The possible exception is industrial and manufacturing engineers and quality control inspectors for which some additional personnel may have to be recruited from outside the immediate area. However, due to the general attractiveness of the Mesa area, this is not seen as a major problem.

Employment at the Mesa facility will build to approximately 2,000 people by mid-1985. Including turnover rate of approximately 10-15 percent, this will require an average weekly hiring rate of 15-16 employees. There is currently an applicant flow through Mesa area employment offices of approximately 20 a day. Unsolicited inquires received from the Mesa area as a result of the July 1981 announcement plus responses to a single weekend newspaper ad (Phoenix) totaled over 1,000. Of these, 850 were skills that could be utilized on the AH-64A program. With continuous monitoring by top level management, the Army feels that HHI can meet the manpower goals.

COST OF THE AAH

Senator GOLDWATER. Two years ago, when members of this committee were concerned over the cost of the AAH, the Army was asked what it would cost to produce an improved Cobra as an alternative to the AAH.

1. The flyaway cost we were given then for an improved Cobra equipped with: Hellfire; TADS/PNVS; A T-700 engine; and Four Blade Rotor was $3.23 million in constant fiscal year 1980 dollars. The flyaway cost of the AAH was estimated to be $4.21 million in the same dollars. Since then the cost of the AAH has gone up by at least 50 percent in real terms. What do you now estimate the cost of the Cobra would be?

General BROWNE. The flyaway costs of $3.23 and $4.21 million for Cobra and AAH respectively were prepared as part of a cost estimate for procuring 500 upgraded Cobra aircraft in addition to the planned AAH buy of 536 aircraft. This comparison of costs includes the benefits in unit costs of buying 1,036 mission equipment packages. The flyaway costs for Cobra and AAH as alternative systems were $4.07 and $4.32 million respectively. The increase in unit costs is due to the procurement of only 536 mission equipment packages for either alternative. The current Cobra/AAH alternative flyaway costs are $7.00 and $8.12 million respectively, in constant fiscal year 1982 dollars.

It should be noted that while the procurement cost of the AAH has grown substantially over the past 2 years, the O. & S. cost (which typically accounts for well

over half the total life cycle cost of a weapon system) has only grown by approximately 8.4 percent in escalated dollars.

AH-64 INCREASED COSTS

Senator GOLDWATER. Now that the Army is fully aware of the increased cost of the AH-64 and the fact that 90 helicopters have been eliminated from the planned buy, has the Cobra alternative been reexamined?

General BROWNE. The Cobra alternative has been reexamined by the Army. Upgrading the Cobra to approximate the AH-64 performance capabilities will require a development program of 48-52 months at an R. & D. cost of $637 million (then-year dollars) and will produce a Cobra with an average unit procurement cost of $14.5 million compared to the AH-64's $13.2 million (then-year dollars). The result would be a Cobra that would be less capable, more vulnerable, and less crashworthy than the AH-64 and would have a 20-year operating and support of 5 percent more. Moreover, full fielding of 446 upgraded Cobras would be at least 5 years later than today's plan for AH-64.

Senator GOLDWATER. In addition to sharp cost increases, we have learned of a completely redefined production schedule between now and fiscal year 1987. Rather than achieving a steady production rate of 8 aircraft per month (96 per year) through mid-fiscal year 1988, as was previously planned, the Army now proposes to gradually ramp to a peak of 140 aircraft per year in fiscal year 1986 then drop sharply to 26 aircraft in 1987 completing the reduced buy of 446 aircraft.

How did the Army arrive at this new profile?

General BROWNE. The Army considered availability of funds within its total obligational authority for fiscal years 1983-87 and added funds to each year of AH-64 procurement to the extent possible to achieve an efficient production rate.

Senator GOLDWATER. Is it an economical profile?

General BROWNE. Within the funds for fiscal year 1982 and fiscal year 1983, the production rate to be achieved in fiscal years 1984-87 is economical.

Senator GOLDWATER. Were other profiles considered and, if so, what were they?

General BROWNE. Yes. At the Army Systems Acquisition Review Council, maximum production rates of 8 and 15 AH-64s were considered.

Senator GOLDWATER. Are there other profiles that are more economical?

General BROWNE. A maximum production rate of 15 per month in fiscal year 1985 and 1986 would be more economical if additional funds are made available in fiscal years 1982-85.

ARMY ATTACK HELICOPTERS

Senator GOLDWATER. How does the Army determine requirements for attack helicopters? Is the requirement a direct function of the potential threat?

General BROWNE. Army attack helicopter requirements are a direct function of the force structure and combat power required to meet the projected threat. Attack helicopters are an integral part of the combined arms team and as such function as a critical combat multiplier through use of their superior survivability, mobility, firepower, and flexibility.

AAO FOR ATTACK HELICOPTERS

Senator GOLDWATER. What is the Army's current Army Acquisition Objective (AAO) for the attack helicopter?

General BROWNE. The current AAO for attack helicopters is 595 AH-64 and 1,072 AH-1S.

Senator GOLDWATER. What was the basis for reducing the planned buy of 536 AH-64 to 446?

General Browne. In November 1981, the ASARC reviewed the Army's program to buy 536 AH-64. Due to affordability, the Army determined that 446 Apaches would fulfill its most urgent requirements. The Army elected to equip with the AH-64 only the highest priority units of the Rapid Deployment Force and USAREUR.

Senator GOLDWATER. How do you respond to critics who say we are developing weapons that are so sophisticated, complex, and expensive that we can only afford to field a small number of them. Isn't this reduction to 446 helicopters a textbook example to prove that argument?

General BROWNE. The United States today faces a potential enemy that will both outnumber us, and is armed with equipment as good as or better than our own. To deter war, we must be ready to counter this threat anywhere in the world where United States interests are at risk. We need balanced forces to insure success in any

conflict; forces capable of conducting battle 24 hours a day and under adverse weather conditions. The sophistication designed into the AH-64 is necessary to operate under these conditions. The reduction to 446 helicopters was not made based upon sophistication, but was an Army decision due to total Army affordability.

Senator GOLDWATER. It is interesting to note that from its first appearance in the Selected Acquisition Reports (SAR's) in January 1975 until April 1979, the AH-64 cost summary promised:

"The flyaway cost goal of $1.704 million (in constant fiscal year 1972 dollars) will be adhered to by the Army through trade-offs."

What was the meaning of that statement?

General BROWNE. The meaning of the statement was an intent to achieve this goal for the weapons system then envisioned, which was the TOW-equipped AAH.

Senator GOLDWATER. What sort of trade-offs were envisioned?

General BROWNE. In the early stage of Design-To-Cost, DTC consisted of recurring manufacturing plus non-recurring tooling costs only. The $1.704 million figure established in 1973 applied to a TOW missile equipped AAH, and the Army's goal was to procure to that configuration or apply hardware changes to reduce costs to that figure. The entire range of hardware trade-offs was to be considered.

Senator GOLDWATER. Why was that sentence deleted from subsequent SAR's?

General BROWNE. Subsequent to the decisions to increase the procurement objective to 536 AAH's; incorporate the Hellfire missile system and the TADS/PNVS into the AAH; as well as OSD redefinition of Design-To-Cost to include the impact of revised cost accounting standards, allowance for cost of money, system program management costs and engineering changes; the statement was no longer appropriate.

AH-64 PROGRAM

Senator GOLDWATER. Now that the Army has abandoned its commitment to adhere to a cost goal the price of the helicopter has risen dramatically.

Is it the Army's desire to buy this helicopter at any price?

General BROWNE. No. The Army has not abandoned a cost goal for the AH-64. The AH-64 has been designed to fulfill a vital and unique role for our Army forces and is clearly ready to transition to production. Our tests and analyses show that the technical problems are solved. We are concerned over the recent increases in the procurement cost estimate but believe that this program can, if negotiations are favorable, offer good value to the government. We are now negotiating with the contractors and will procure the AH-64 only after we strike a fair price.

Senator GOLDWATER. Since there is no guarantee that this will be the end of the cost growth for the AH-64, at what unit cost would the Army feel compelled to recommend termination of the program?

General BROWNE. The Army would reassess its decision to proceed with procurement of the AH-64 if the unit cost should increase beyond that considered to be a fair price which no longer could satisfy its cost effectiveness for incorporation into a fielded Army.

Senator GOLDWATER. Even if we achieve the real growth in defense spending projected by the administration, there is still a very finite limit on the spending authority available to the Army. If the AH-64 program will now cost $1 billion more than was projected last year, what offsets does the Army intend in order to fund this increase? Bear in mind that the costs of other programs have also grown adding to the budgetary pressure created by the AH-64 cost growth.

General BROWNE. The extent of the cost growth in the AAH program was discovered while preparing estimates of the most likely cost of production. In the process of analyzing alternatives the expected contribution of the AAH on the battlefield was examined further. In the last 10 years the Soviet Bloc forces as the result of an unprecedented peace time modernization and expansion have achieved many quantitative and qualitative advantages in arms and equipment. In response our Army is conducting a major modernization program in the 1980's to field a credible deterrent to that threat. A number of new weapons systems including the AAH are being fielded simultaneously to produce a balanced battle team. In this manner the capabilities of our units in the field are synergistically expanded by the application of modern technology. In this capacity the AAH is needed as a force multiplier to improve our day and night capability to repulse large enemy armor attacks. The AAH in this role even at the higher price was found to be an essential ingredient of the Army's modernization program. In seeking to field the AAH promptly in adequate numbers with the resources available, the Army reshaped the procurement program. The helicopters in this program will be produced at a higher production rate

in fiscal year 1985 and fiscal year 1986 in order to take the best advantage of more economical production rates with the available funds. The Army made the necessary resource adjustments last fall to support this production strategy which have been approved by the Office of the Secretary of Defense.

Senator GOLDWATER. Will other programs be stretched out?

General BROWNE. Yes. The signing of the production contract for the FLIR Augmented Cobra/TOW Sight production and modification was slipped one quarter and funded in fiscal year 1985. Additionally, the field artillery ammunition supply vehicle production was reduced by 215 vehicles in fiscal year 1984. These vehicles will be procured in fiscal year 1987.

Senator GOLDWATER. Over the past 2 years how many of the Army's weapons development and procurement programs have been stretched out?

General BROWNE. In response to the need to modernize the Army, to procure weapons at more economical rates, and to best use the additional funds made available during this administration the production rates have been increased for most items in the aviation, missile, weapons, ammunition, and ground vehicle programs. Affordability considerations have necessitated stretching out the Fighting Vehicle System and Pershing II programs between the level of the Carter 1982 and the Reagan 1982 and curtailing the deployment of Roland.

Senator GOLDWATER. Will the Army seek offsetting reductions from readiness accounts such as training or operation and support?

General BROWNE. Yes. A transfer of $116.2M is programed for fiscal year 1984 that affects training, operations, and support. Funds were made available from construction projects, and reductions in combat and combat service support resources for active forces and Congressional actions concerning Army personnel program initiatives.

Senator GOLDWATER. Will offsets be made that reduce our sustainability (e.g., ammunition accounts)?

General BROWNE. No. The offsets in the ammunition accounts will not reduce sustainability. In fiscal year 1984 $95.8 million will be made available from a deleted $25.8 million production requirement for 81mm mortar ammunition and an approximately 10 per cent reduction in programed training ammunition production.

Senator GOLDWATER. If an additional $1 billion must be found in order to procure this helicopter, is the Army prepared to terminate lower priority programs in order to fund this one?

General BROWNE. If an additional $1 billion must be found in order to procure the AH-64, the Army would look at the cost effectiveness of the program versus "give-ups", and then make a determination as to affordability.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

TRADOC AND DARCOM

Senator THURMOND. Secretrary Ambrose, two key players in the requirements development process are the user and the developer, the user being the Training and Doctrine Command, TRADOC, and the developer being the Army Materiel and Development Command, DARCOM. Theoretically, TRADOC delineates the functional requirements and DARCOM develops the system to meet those requirements.

It is my understanding, Secretary Ambrose, that TRADOC's budget is so small in comparison to that of DARCOM that this disparity would tend to put DARCOM in the driver's seat, that is, DARCOM would tend to initiate requirements and develop the system.

Does DARCOM initiate requirements? To what extent is this problem reflected in the AH-64 program, and shouldn't such practice add to the cost growth because the requirements do not truly reflect the user's interests, a fact which will cause repeated and costly changes?

Secretary AMBROSE. TRADOC develops requirements which are validated by HQDA. DARCOM uses these requirements to develop the system. As to the AH-64 program, a special attack helicopter task force determined the AAH requirements through extensive studies and computer analysis. These requirements have been reviewed by the Army—with user and developer participation and concurrence—over time with regard to the potential threat and updated as necessary.

AH-64 UNCONTROLLED COST GROWTH

Senator THURMOND. Let me begin by saying that I am deeply concerned about what appears to be uncontrolled cost growth in the AH-64 program. I am and

always will be an ardent supporter of a defense second to none, but this cost growth is very disconcerting. It is the function of this committee to authorize those expenditures necessary for the common defense. It is, however, also the function of this committee to ensure that those funds authorized are spent in the most judicious manner possible.

With that in mind, what are the alternatives to the AH-64 and what are the comparisons in capability, cost and time-frame of availability?

General BROWNE. There are no feasible attack helicopter alternatives with the AH-64's capabilities to elevate our defense posture to the necessary level to counter the threat. The Army has repeatedly considered other helicopter alternatives to fulfill the need.

The alternatives considered and reasons for rejection follow:

1. Procuring a large quantity of additional TOW-equipped AH-1S's instead of AH-64's is not an acceptable course of action. Cost and operational effectiveness analyses of this course give unacceptable combat exchange ratios against the threat and the increase in pilots and maintenance personnel necessary to support this large quantity increase cannot be achieved.

2. Interim near-term modifications to existing Black Hawk or AH-1 airframes which would allow the capability to deliver Hellfire missiles but which does not provide integral designation, night vision, and an upgrade in combat survivability cannot provide any appreciable improvement in effectiveness to counter the threat.

3. The remaining course of action is to develop an alternative helicopter to the AH-64. Some call this a modification to an existing helicopter—it cannot be a modification—it requires a new development program requiring major airframe and powertrain design with corresponding ground and flight testing comparable to what has already been accomplished on the AH-64 to verify and qualify its airworthiness and safety. Subsystem integration and flight test demonstrations would be required, development of a supporting logistics system, and operational testing prior to approval for production would also be required. This constitutes a full-scale engineering development program in order to approximate the performance and survivability capabilities of the AH-64. Given the time and the money, the Army is capable of developing such a vehicle for production approval. However, that vehicle will require 4 to 5 years to develop and test at a cost of $637 million in then year dollars. The Cobra would have an average unit procurement cost of $14.5 million compared to the AH-64's $13.2 million (then-year dollars). The result would be a Cobra that would be less capable, more vulnerable, and less crashworthy than the AH-64, and would have a 20-year operating and support cost of 5 percent more. Moreover, full fielding of upgraded Cobras would be at least five years later than today's plan for AH-64.

AH-64 CHANGES TO LOWER COST

Senator THURMOND. What changes in capability of the AH-64 is the Army willing to accept in our effort to lower cost?

General VESSEY. In 1972, the Attack Helicopter Task force reviewed AAH requirements for the modern battlefield using computer simulation and other studies. Results showed the need for improvements in the following areas: flight performance; firepower; survivability; payload/endurance; visionics; reliability, availability, and maintainability (RAM); avionics; reaction time; and deployability. As a result, the AH-64 was designed from the ground up to meet these requirements, and to fight and live on the front line and be responsive to the ground commander day/night and in adverse weather.

Throughout system development, these requirements have been continually reassessed and updated as the threat has changed. Any reduction of capability of sufficient magnitude to noticeably reduce cost would degrade battlefield effectiveness and prevent the Army from achieving its necessary modernization goals.

ARMY PROGRAM CHANGES

Senator THURMOND. Given the large cost increases in this program, what are the resultant changes in other Army programs?

Mr. AMBROSE. In November 1981 the Army System Acquisition Review Council determined the budget adjustments to support the AAH program that were later approved by the Office of the Secretary of Defense. These program budget adjustments are listed on the chart below. The major resource contributors for the increased AH-64 funds were the SOTAS program that was terminated by Congress in the fiscal year 1982 budget review and funds from a repricing of ammunition with reduced inflation estimates. The production contract for the FLIR-Augmented

COBRA/TOW Signt production was slipped one quarter to fiscal year 1985. The field artillery ammunition supply vehicle production was reduced by 215 vehicles in fiscal year 1984. These vehicles will be procured in fiscal year 1987.

ADVANCED ATTACK HELICOPTER/HELLFIRE BILL PAYER LIST

[In millions of dollars]

System/Initiative	APPN	Fiscal years—					
		1982	1983	1984	1985	1986	1987
ADV ATK Helicopter	APA	+78.3	+100.0	+559.5	+699.6	+375.2	−559.2
Hellfire MSL	MPA	+50					
CBT Mission Simulator	APA				+23.5	+42.2	+25.4
Other Proc	OPA			+3.3	+6.4	+10.7	+2.8
RDTE	RDTE		+21.1	−1.4	−0.6		
Subtotal		[1] +83.3	+121.1	+561.4	+728.9	+428.1	−531.0
Ammo Repricing	PAA		−106.0	−136.0	−165.0	−183.0	−195.0
Sotas-Zero Cur Prog	VAR		−87.9	−78.7	−523.1	−533.8	−535.5
AH–1S (Cobra-Facts MOd)	APA			−104.0			+150.0
ACFT RDTE	RDTE			−6.9			
Ammo	PAA			−95.8			+100.0
Ammo Supply VEH	WTCV			−71.4			+150.0
Foreign Nat'l Hircs	OMA			−30.0			
MIL PERS TVL (PCS)	MPA			−42.0			
OMA Adjustment	OMA				−216.0		+250.0
MHE/Const EQ/Night Visions	OPA						+235.0
SUS Blackhawk/BDS	VAR						+376.5
Total	([2])		−193.9	−564.8	−904.1	−736.8	+531.0

[1] Fiscal year 1982 offset is results of congressional acxtions/reporgraming action.
[2] Offsets do not exactly equal since other program adjustments were made simultaneously with the AAH adjustment.

Senator THURMOND. You have before you a copy of the five basic concerns expressed by the General Accounting Office to the Secretary of Defense. Would you please address each of these points?

You decreased the number of aircraft to be procured by 90 units. How did this impact on cost and mission capability?

General BROWNE. Decreasing the procurement quantity by 90 units decreased the program cost by $654 million and increased the procurement unit cost from 12.2 to 13.1 million dollars. While the reduction in quantity of fielded aircraft hurts, the Army's mission capability is still significantly enhanced by AH–64 force modernization.

MARINE CORPS AND THE AH–64

Senator THURMOND. What interest, if any, has the Marine Corps shown in the AH–64?

General BROWNE. The U.S. Marine Corps has conducted an evaluation of the AH–64 and indicated a desire to purchase 120 aircraft commencing in fiscal year 1986.

TADS CONFIGURATION

Senator THURMOND. The data currently available for decision purposes includes data derived from tests of two key subsystems—the target acquisition designation sight (TADS) and the helicopter engine—whose configuration will differ from the subsystems to be made a part of the production aircraft.

General BROWNE. The TADS configuration used in Operational Test II is not the final production design but did have all major design features except two. The first feature is microminiaturization of TADS which is a conservative program with low technical and schedule risk. All hybrid component design, fabrication and tests were completed successfully. Engineering models are built and tested. Fabrication of three of the boxes is complete, with the fourth box to be completed by mid-February. Qualification testing is scheduled to begin February 10, 1982 and will be completed by mid-June. This effort and the flight test to verify system integration are low technical risk. The relationship of these test schedules to the production schedule provides a significant degree of flexibility should a problem arise.

Second, testing of two production lasers is also nearing completion. Engineering acceptance tests already accomplished on the production laser have shown that the design is sound and meets requirements. One unit has accumulated over 2 million shots, and the other unit over 6 million shots. Qualification testing will be completed in February 82.

The engine that has been used in AH-64 flight tests is the T700-GE-700. The production engine, T700-GE-701, is not a new engine but incorporates a low-risk modification based on a design feature of the T700-GE-401 LAMPS engine. The tests for the -701 engine are proceeding well. A total of 7.2 hours of flight testing has been successfully completed. The Army does not envision any complications in marrying the airframe and engine since there are not any dimensional, weight, attachment, or significant stress changes.

Senator THURMOND. Caution should be used in accepting the AH-64's reported reliability, availability, and maintainability calculations since they may be overstating the helicopter's capability in these areas.

General BROWNE. The AAH RAM requirements are values to be achieved at maturity—the point in time when 100,000 hours of fleet operation following deployment are achieved. For the AAH, this will occur in calendar year 1986. To date, the Army has applied established scoring and evaluation techniques to assess Operational Test II and development test data for the prototype helicopters. The Army assessments have shown that, for every RAM parameter except aircraft mean time to repair and TADS subsystem reliability, the maturity objectives have already been met. In these two instances, they are meeting the growth curve predictions toward achieving their requirements by the prescribed maturity milestone date.

ARMY'S ABILITY TO SUPPORT HELICOPTER PROGRAM

Senator THURMOND. The Army's ability to adequately support the helicopter for an extended period after initial deployment is questionable.

General BROWNE. The Army has planned and is implementing an extensive integrated logistic support program fully capable of supporting total system deployment. In full scale engineering development, the Army had available a system support package as planned which was used in a typical Army field environment during training and operational testing. The parts, support equipment, training and manuals which are part of the overall logistics program provided outstanding support to the aircraft over a five-month period. During this time, the prototype aircraft averaged 48 flight hours per vehicle per month. This flying hour program far exceeds the planned peacetime utilization of 20 flight hours per month. Support for deployment over an extended time is believed to be adequate.

HELLFIRE

Senator THURMOND. The laser Hellfire missile, although it has generally shown an advantage in testing in a clear environment, still has some serious shortcomings that could limit the AH-64's total system effectiveness.

General BROWNE. The report implies that tests of the laser Hellfire missile were incomplete and that firings were made under clear environmental conditions. Extensive testing under conditions other than optimum has been successfully completed. Many of the 59 missile firings in the Hellfire Development Test (DT) program were conducted in smoke, and/or dust environment. The Battlefield Obscuration Firing Program consisted of eight missiles fired in various obscurants including rain and fog. The 33 missiles fired during the Hellfire Operational Test (OT) and the 12 missiles fired during the AAH/Hellfire OT II were in a naturally dusty, typical operational environment. Thirty-six missiles were deliberately fired in obscurants during DT and OT firings. The Army considers that these firings adequately demonstrate the AH-64's total system effectiveness in the typical obscured battlefield environment.

CONTRACTOR READINESS

Senator THURMOND. Contractor readiness to begin production is still at a point where it is not without some potential program-inhibiting risks.

General BROWNE. The final production readiness reviews (PRR) conducted by the Army in August 1981 did identify potential program risks including:

a. Construction of Mesa facility.
b. Production equipment move at Culver City.
c. Mesa manpower availability.
d. Culver City manpower availability.

e. C/SCSC validation.

f. Update of Quality Assurance Plan for production. The PRR identified the above items as "Medium" risk, i.e., tight but achievable, requiring intensive management attention to insure that these items do not result in adverse program impact. In early November, a follow-up review was conducted on those items of concern identified at the PRR. Required progress on all the above items was either on or ahead of schedule. This review strengthened our position that the risks involved are acceptable.

The Army believes that the formidable and unique capability of AH-64 and Hellfire is needed in our force structure and that these programs are ready to enter production. The information necessary for a production decision is available from the extensive tests of these programs.

AH-64 SALES TO FOREIGN MILITARY

Senator THURMOND. Are there any prospects for foreign military sales for the AH-64, and if so, who and in what quantities and what is the impact on unit cost?

General BROWNE. Yes. The Federal Republic of Germany (FR/GE) is considering the AH-64 as one of three candidates for its anti-armor helicopter. If the AH-64 wins that competition, the FR/GE would procure 150 aircraft. Another country has displayed interest in obtaining 21 AH-64's. If the USMC buy and these procurements occur, the procurement quantity of the AH-64 will increase from 446 to 737 and the flyaway unit cost will decrease from $10.2 million to approximately $9.7 million.

Senator THURMOND. Why is Hellfire production being accelerated when AAH is being curtailed?

Colonel CASS. The AH-64 program was accelerated to an economic production rate in fiscal years 1984-86 as part of the Army's AH-64/Hellfire production decision. The Hellfire program was not accelerated, because it was already planned for an economic production rate which also meets the accelerated fielding schedule of the AH-64.

QUESTION SUBMITTED BY SENATOR JOHN WARNER

HUGHES HELICOPTERS, INC.

Senator WARNER. In order that this committee may have a better appreciation for this one facet of the AH-64 program, I would like the Defense Contract Audit Agency to conduct a thorough review of the financial stability of Hughes Helicopters, Inc., and provide me and my staff with a detailed briefing on their findings by March 1, 1982. Prior to conducting such review, I would like the representatives of the DCAA to meet with the committee's general counsel to insure that all of the issues which are of concern to this committee are properly addressed in this review. Do you have any problems with complying with this request or meeting the March 1 deadline?

Mr. AMBROSE. I will look at this matter and work with the committee and staff members to insure that all of the issues are properly addressed.

QUESTIONS SUBMITTED BY SENATOR ROGER JEPSEN

AH-64 PRODUCTION LEARNING CURVE

Senator JEPSEN. What is the projected learning curve for AH-64 production?

General BROWNE. The projected learning curve, at a price level, for the AH-64 without the additional funding provided at the Army Systems Acquisition Review Council for most likely cost is approximately 88 percent for constant year dollars. This composite curve recognizes all subcontracts within the prime contracts.

UH-60 BLACK HAWK

Senator JEPSEN. Wasn't the failure of the UH-60 Black Hawk helicopter to achieve its learning curve a prime driver of cost growth in that program?

General BROWNE. No, the prime driver of the Black Hawk cost growth was the magnitude of design changes incorporated during the production buys. Those changes were not in the initial estimate for labor hours. The actual labor learning curve experienced by Sikorsky did not materially deviate from that originally projected.

PROJECTED LEVEL OF LEARNING

Senator JEPSEN. What difficulties do you expect in trying to achieve the projected level of learning?

General BROWNE. The current status of the AAH development effort is such that the usual problems of lack of a fully defined production configuration at contract award causing a high number of changes and producibility problems; high turnover in either shop labor or management personnel; late or total failure of subcontractors/vendor deliveries causing work arounds and excess overtime for "rush-job" orders; and inadequate tooling to support expected rates have been minimized. Specifically, production drawings are 95 percent complete, manufacturing planning packages are 82 percent complete and 92 percent of the tooling design has been completed at Hughes Helicopters. As far as personnel are concerned, the new personnel are being trained and then merged with "Core Teams" to provide maximum learning experience transfer during the first production buy. Also, the Mesa area has a much lower turnover rate than that prevalent in the Los Angeles area. All major and selected minor subcontractors had producibility engineering planning programs and are 100 percent complete with their production drawings, manufacturing planning and production plans. All have been provided long-lead funding to support the initial schedule. Hughes has completed a capital equipment plan and is on schedule. They have also developed second-sourcing plans for critical items as part of the capital equipment plan. In general, the projected levels of learning are consistent with industry experience, and are in fact slightly more conservative than those currently being experienced by the Black Hawk program. In summary, we believe that the learning levels projected for the Apache will be achieved.

Senator JEPSEN. Could you give me some useable measure of how much per unit costs will increase for each percentage point of projected learning that the contractor fails to achieve?

General BROWNE. For a quantity of 446 aircraft on an 88-percent price curve, a deviation to 89 percent would result in an increase in average unit recurring hardware cost of about 8 percent. For the entire procurement program, including tooling and other nonrecurring costs (training, logistics, data, etc.), this would represent about a 5 percent program cost delta.

Senator JEPSEN. Will your recent changes in the annual production profile have any effect on your learning curve projections?

General BROWNE. The net effect of the changes in the annual production profile is steepening the learning curve slightly since it recognizes the more effective production rates in the later years when the rate grows to 12 aircraft per month. Increasing the production rate to a more efficient 12/month vice 8/month saves the taxpayer and the government approximately $100 million in the procurement of 446 AH-64s.

AH-64 SECOND SOURCE

Senator JEPSEN. Have you looked at the possibility of setting up a second source for the AH-64 or some of the subcomponents?

General BROWNE. The Army is evaluating second sourcing for the AH-64. A package of AH-64 drawings is being assembled for analysis. An option is contained in the TADS/PNVS production contract for a competitive technical data package which can be exercised if completion of TADS/PNVS becomes cost effective. The Army and Hughes Helicopters are also looking at second-sourcing various components. A second source for the fuel cell subsystem is being established.

Senator JEPSEN. How feasible is it?

General BROWNE. Establishment of a second source contract for the complete AH-64 would take approximately 2 years and require several hundreds of millions of dollars for second-source qualification. Although possible, great difficulty would be experienced with the electrical and hydraulic subsystems, software, and integration. Initiating second sources for AH-64 components is feasible and is being pursued where appropriate.

Senator JEPSEN. How much savings could result if we started to fund a second-source now?

General BROWNE. It has not been determined that there would be any savings by second-sourcing the entire aircraft because of the high cost of establishing a second source with a total production quantity of only 446 aircraft.

QUESTIONS SUBMITTED BY SENATOR HOWARD CANNON

ARMY MODERNIZATION PROGRAMS

Senator CANNON. General Merryman, in the list of priorities for the Army's modernization programs where does the AH-64 program rank?

General MERRYMAN. The AH-64 Apache priority ranks in the top ten percent of the Army's modernization programs.

Senator CANNON. Secretary Ambrose, as things now stand with the Army's modernization program, should the AH-64 enter production at this time?

Secretary AMBROSE. At the Army Systems Acquisition Review Council in November 1981, the Army determined that the AH-64 program is ready to transition to production. It is vital to the timing of the Army's modernization program that the AH-64 enter production now if the Army can reach a fair price in negotiations with the contractors.

Senator CANNON. General Browne, break out the procurement portion of the increase in the baseline program of 536 aircraft from the March 1981, SAR estimate in terms of (a) nonrecurring costs; (b) recurring costs of prime contractors manufacturing overhead, prime contractor direct labor, prime contractor direct material and other overhead and fees; (c) support equipment and data; and (d) spares.

What are the estimates for these categories for the March 1981, SAR estimate of total procurement cost?

General BROWNE. The breakout of procurement costs for Hughes Helicopters is as follows:

	March 1981 SAR 536 AH-64's	ASARC approved program 446 AH-64's	Difference
Nonrecurring	85.0	176.8	+91.8
Recurring	2068.8	2458.5	+389.7
Direct labor	(91.0)	(136.2)	(45.2)
Material	(1373.7)	(1653.1)	(+279.4)
Overhead	(604.1)	(669.2)	(+65.1)
Other procurement (support equipment and data)	353 1	463.3	+110.2
Spares	148.7	341.6	+192.9

Senator CANNON. General Browne, do you forecast annual procurement rates above the 96 per year maximum in prior estimates? What is the reason for this? What is the new maximum rate and how long will it be sustained? Will this require additional tooling costs over earlier estimates, and how much will they be?

General BROWNE. Yes, we intend to build up to a peak rate of 12 per month or 140 aircraft in fiscal year 1986. this was done to get the greatest number of helicopters with the Army's available funds. The maximum rate of 12 aircraft per month is sustained for 10 months prior to completing the buy in 1987. Additional tooling cost of $54 million is funded. However, even after all costs are considered, the 12 per month is a more efficient manufacturing rate that results in earlier delivery and a cost savings to the taxpayer of about $100 million.

AH-64 VERSUS AH-1S

Senator CANNON. General Vessey, given the current cost estimate for the AH-64 program, is the AH-64 more cost effective than the AH-1S outfitted with a pilot's night vision system and a night sight for the TOW gunner?

General VESSEY. Our studies show that the weight penalty of installing a FLIR-equipped pilots night vision system in addition to the gunner's night sight on the AH-1S degrades the performance so as to make it an unacceptable alternative for consideration.

Senator CANNON. General Vessey, given the current cost estimate for the AH-64 program and cost estimates to upgrade the AH-1S attack helicopter to a configuration where the AH-1 would have a pilot's night vision system, a T-700 engine and a Hellfire capability, does the AH-64 remain more cost effective?

General VESSEY. Yes. Upgrading the AH-1 as described would: first, delay introduction to the forces of the vital capabilities of the AH-64 weapons systems for 4 to 5 years; second, deliver a system which is more vulnerable, less survivable, and less

capable on the battlefield; and third, costs more when procured than the AH-64 that is ready for procurement now.

Senator CANNON. General Merryman, please provide a side-by-side comparison of lifecycle costs in constant dollars for equal cost of forces of (a) 446 AH-64 aircraft, (b) cost of an equal number of AH-1 aircraft equipped with PNVS and a TOW night sight; and (c) cost of an equal number of AH-1 aircraft modified with a T-700 engine, TADS, PNVS and Hellfire capability.

General MERRYMAN. The life cycle cost comparison for 446 AH-64's and 446 AH-1's modified with T-700 engines, TADS, PNVS and Hellfire capability is as follows:

[In millions of dollars]

	AH-64	AH-1 [1]
Fiscal year 1982 dollars	10,535	9,446
Escalated dollars	17,558	18,248

[1] Paper design.

The AH-1 equipped with a PNVS and a TOW night sight has not been costed by the Army since the combined weights of those equipments degrade the performance capability of the basic AH-1 so as to make it an unacceptable alternative.

Senator CANNON. General Merryman, what would the relative effectiveness of the above forces be?

General MERRYMAN. Based upon the current AAH COEA and the PM's analysis of the results, the procurement unit cost of the Apache is approximately 2½ times that of an AH-1S Cobra but the Apache is [deleted] more effective. Although a significantly higher number of Cobra aircraft could be procured, their operating and support cost would be $14.5 billion greater for twenty years but the Cobra fleet would still not be as effective as the AAH fleet. To field the AH-1 in this quantity, the Army's force structure would need virtually total revision to accommodate the increased units and manpower (assuming the personnel can be recruited). The training base as it exists is inadequate to support the increased student load and the facilities and logistical impact of the increased fleet size, particularly OCONUS, would be tremendous.

The Army has conducted an intensive evaluation of possible modifications to the Cobra to fully examine the potential of this airframe for the AAH mission. This included mounting TADS/PNVS, Helfire, T700 engine, four-bladed rotor system, and other AAH mission equipment on the AH-1S. The technical, cost, and schedule investigation led to the conclusion that a development program of 48-52 months at an R. & D. cost of $637 million (then-year dollars) will produce a Cobra with an average unit procurement cost of $14.5 million compared to the AH-64's $13.2 million (then-year dollars). The result would be Cobra that would be less capable, more vulnerable, and less crashworthy than the AH-64, and would have a 20-year operating and support cost of five percent more. Moreover, full fielding of upgraded Cobras would be at least 5 years later than today's plan for AH-64.

ATTACK HELICOPTER INVENTORY GOAL

Senator CANNON. General Vessey, what is the Army's inventory goal for attack helicopters? What is the inventory goal for the AH-64?

General VESSEY. The current Army Acquisition Objective for the attack helicopter fleet is 1,667: 595 AH-64s and 1,072 AH-1s.

Senator CANNON. General Vessey, what does the Army plan to do to reach these goals with the reduction in scope of the AH-64 program? Will this lead to the procurement of more AH-1s aircraft?

General VESSEY. Due to affordability, the Army plans to procure 446 AH-64s to add to a fleet of 1,000 AH-1s, of which 815 have been fielded. The Army did not increase the procurement of AH-1s when the AH-64 buy was reduced.

FORWARD-DEPLOYED UNITS IN EUROPE

Senator CANNON. General Vessey, will the Army's forward-deployed units in Europe receive the numbers of AH-64 helicopters they would have received under the 536 aircraft program with the program reduction to 436 helicopters?

General VESSEY. Under the current distribution plan, forward-deployed units in Europe would receive the same numbers of AH-64 helicopters with the program reduction to 446 helicopters as they would have with the 536 aircraft program.

Senator CANNON. General Vessey, where will the shortfall of 90 AH-64 helicopters be absorbed?

General VESSEY. In lower priority CONUS units.

HUGHES HELICOPTERS, INC.

Senator CANNON. General Browne, do you believe that the prime contractor is financially sound enough to begin production of the AH-64?

General BROWNE. Yes I do. After the Defense Contract Audit Agency (DCAA) raised concerns about the financial capability of Hughes Helicopters, Inc., a week-long on-site detailed analysis, during late October 1981, was conducted by the responsible command: AVRADCOM. From that review, the Commanding General, AVRADCOM concluded that HHI has sufficient financial resources, including the ability to obtain such financial resources, required to perform the APACHE program. Prior to initial production contract award, the contracting officer will again review HHI's financial condition to insure that the circumstances and conditions as reviewed in October 1981 have not changed in the intervening period.

Senator CANNON. Secretary Ambrose, do you believe that the prime contractor is financially sound enough to begin production?

Mr. AMBROSE. I have reviewed the DCAA report and the AVRADCOM determination discussed by General Browne and I will meet with representatives of DCAA to continue my assessment. I will work with the committee and the staff members to insure that all the issues are properly addressed and a timely assessment is made of the financial capability of Hughes Helicopters prior to award of a production contract.

MESA PRODUCTION FACILITY

Senator CANNON. General Browne, are you confident that the AH-64 can be produced in a yet to be built facility without further cost impacts on the program? What is the basis for your answer?

General BROWNE. I do not foresee any negative cost impact to the AH-64 program from Mesa, Arizona final assembly and flight test facility construction. To the contrary, I expect cost benefits to accrue since the labor market is much less competitive than in the Southern California aerospace area.

AH-64 READY FOR PRODUCTION

Senator CANNON. General Browne, is the AH-64 ready for production?

General BROWNE. Yes it is. All major technical problems have been resolved and fixes for the shortcomings identified during operational testing are in hand. Producibility engineering planning has been essentially completed and production readiness reviews of all involved contracts successfully accomplished. As soon as contract negotiations are completed, the AH-64 is ready to go.

DIFFERENT ENGINE AND DESIGNATION SIGHT

Senator CANNON. General Browne, the December GAO report on the AH-64 referred to earlier expressed doubts about the readiness of this aircraft for production. Specifically the GAO is concerned that the production aircraft will have a different engine and a different target acquisition designation sight from those used in preproduction testing. What is your view of this issue?

General BROWNE. The engine that has been used in AH-64 flight tests is the T700-GE-700. The production engine, T700-GE-701, is not a "new engine." It is a low-risk modification based on a design feature of the T700-GE-401 LAMPS engine. There are no dimensional, weight, attachment, or significant stress changes. The flight tests of the AH-64 with the -701 engine are proceeding well. We will complete qualification of the AH-64 with the -701 engine this June, almost 2 years prior to the delivery of the first production aircraft.

Regarding the TADS, the configuration used in OT II was not the complete final production design, but did have all major design features except two. The first feature is micro-miniaturization of TADS electronic boxes, which is a conservative program with low technical and schedule risk. All hybrid component design, fabrication, and tests were completed successfully. Engineering models are built and tested. Fabrication of three of the boxes is complete with the fourth box to be completed by mid-February. Qualification testing is scheduled to begin February 10, 1982 and will be completed by mid-June. Additionally, the production schedule provides a significant degree of flexibility should a problem arise. The effort and the flight test to verify system integration are low technical risk.

The second feature missing was the modified laser. Testing of two production lasers is nearing completion. Engineering acceptance test already accomplished on the production laser have shown that the design is sound and meets requirement. One unit has accumulated over 2 million shots in tests and the other unit over 6 million shots. Qualification tests are planned for completion in February 1982.

TADS PRODUCTION

Senator CANNON. Colonel Wray, compared with the delivery date of the first production AH-64, when is the production configuration of the TADS to be ready and how much operational testing will it have had?

Colonel WRAY. The first production TADS is scheduled for delivery in July 1983. This is 8 months prior to the delivery of the first production AH-64 with all mission equipment (PV02). The preproduction configuration TADS has completed 412 hours of operational testing. This configuration includes all the significant design features of the final production TADS except two—the microminiaturized electronics and the production design laser. Both of these are not in qualification testing and will be flight tested in early 1983.

Senator CANNON. General Browne, the GAO report (above) also states that involvement of contractor maintenance personnel in recent preproduction testing was such that they performed, or assisted on, nearly one-half of the maintenance actions. Does this level of involvement invalidate the test results for reliability, availability and maintainability of the AH-64?

General BROWNE. A detailed examination of data from OT II shows that the soldiers performed 75 percent of all maintenance tasks without contractor assistance. The data shows that some of the remaining tasks where contractor participation took place were caused by:

1. Several peculiar development anomalies including engine choking caused by contaminated fuel, a TADS boresight shift resulting from an overheated component on an electronic circuit board, and APU start problems caused by an obsolete air valve.
2. Design modification installed by the contractor which were not the responsibility of OT II maintenance personnel.
3. Uncorrected failures still on the aircraft when delivered for OT II.
4. Some troubleshooting procedures in the maintenance manuals which did not apply to the two older aricraft in the test.

Excluding these causes, only 18 percent of the tasks recorded had necessary contractor involvement. This level of support can well be expected of early prototype aircraft. The low level of contractor involvement does not invalidate test results. The low maintenance manhours per flight hour resulting from the test, by soldiers with limited "hands-on" AH-64 experience, show that Army mechanics can maintain the aircraft under field conditions and do it very well.

RELIABILITY OF TAD SUBSYSTEM

Senator CANNON. Colonel Wray, what was the reliability performance of the TADS subsystem during recent preproduction testing? How does this performance compare with goals in the current Army/OSD decision coordinating paper?

Colonel WRAY. In 1976, a reliability goal of 100 hours mean time between failure (MTBF) was established. In Operational Test (OT) II, TADS prototypes were assessed for 82 hours MTBF for mission reliability and 20 hours MTBF for system reliability. Mission reliability in OT II was considered adequate, and system reliability was less than desired. In either case, the total AH-64 weapons system achieved its reliability goals. An intensive program to improve TADS reliability is on-going and includes a reliability assurance warranty in the production contract. This program is expected to result in a mission reliability of 125 hours MTBF and a system reliability of 63 hours MTBF for achievement after 100,000 operating hours (maturity) of the production TADS. The Army is also assessing the TADS system reliability goal for maturity to determine the cost effectiveness of additional improvement since the AH-64 is expected to surpass its overall reliability goal at maturity.

QUESTIONS SUBMITTED BY SENATOR DAN QUAYLE

Senator QUAYLE. Table 1 details cost estimates from March, 1981. What were the cost estimates at the initiation of the program escalated in the same terms as table 1?

General BROWNE. Cost estimates at program initiation in 1973 escalated in the same terms as table 1 are:

[In millions of dollars]

Development	495.1
Procurement	3,286.5
Program total	3,781.6
Unit flyaway cost	5.5
Unit procurement cost	7.0
Unit program acquisition cost	7.9

Senator QUAYLE. Was Hughes the lowest bidder on the above development program?

General BROWNE. No.

Senator QUAYLE. Was cost a factor in the selection process?

General BROWNE. Yes. Cost was a selection factor but the selection was based on "best value to the Government" all things (cost, technical performance, operational suitability, etc) considered.

HUGHES PROFIT ON CONTRACT

Senator QUAYLE. How much was Hughes expected to receive as profit under the initial terms of the award? Under the current estimates, if the USA position is upheld, and also under the current estimates if Hughes' position is determined to be correct?

General BROWNE. The Hughes production contract submission proposed a 15 percent profit on hardware and a 10-percent profit on services for a cumulative fee of $47.6 million. The Army's "should-cost" negotiation position is still being developed and the reasonable percentage of profit to be negotiated has not been finally established.

Senator QUAYLE. If it should prove impossible to negotiate an acceptable contract with Hughes, what are the estimated cost increases and schedule delays associated with a decision to go to an alternate source?

General BROWNE. No estimate has been prepared. In the unlikely event that the negotiation process fails to produce an acceptable contract, the Army will study its alternatives and select what it considers to be the most appropriate course of action. Cost impacts and schedule delays of the available alternatives would be carefully developed and analyzed during the selection process and would be available to this committee to support the decision.

Senator QUAYLE. Is the new facility at Mesa, Ariz., contractor or Government owned?

General BROWNE. The Mesa facility will be owned by the contractor.

Senator QUAYLE. Since the production lots will be built in a new facility by relatively new and inexperienced personnel, have you considered obtaining bids from alternate sources on a build-to-print basis?

General BROWNE. Establishing a second source for the complete AH-64 would take approximately 2 years and require several hundred millions of dollars for qualification. Although possible, great difficulty would be experienced in alternate source manufacture of the electrical and hydraulic subsystems, software, and integration. Nevertheless, we are looking at the feasibility and economics of such an arrangement. However, aiternate sources for individual AH-64 components are being aggressively pursued.

Senator QUAYLE. Since we are dealing with such a severe cost increase and since Hughes' estimated manhours per pound seem high, have you considered having the detail design and tooling reviewed by an independent team of personnel drawn from industry with a view toward improving the producibility of the AH-64?

General BROWNE. Over $50 million have been spent during the AH-64 development program for producibility, engineering and planning under the watchful eye of the Army's production readiness community. Initial, intermediate, and final production readiness reviews have been conducted by qualified Army and DoD industrial engineers whose purpose was to review and recommend improvements in producibility wherever they appeared practical. The Army's should-cost team, which is an integral part of the negotiating process, also reviews to determine if efficient producibility practice is followed and recommends changes for incorporation where found necessary. We do not believe an additional review by an outside source at this time would be productive.

Senator QUAYLE. Since the cost estimates furnished by the contractor seem high and imply an inefficient contractor, has the Army in this or any other procurement

considered penalizing such contractors by not placing them on an acceptable bidders list until such time as the concerns have been eliminated?

General BROWNE. High cost estimates in proposals do not in and of themselves connote inefficiency. A determination of inefficiency is also based on performance. In the event the contractor displayed such a lack of performance under the contract; consideration of penalties, to include removal from the acceptable bidders list under the provisions of Defense Acquisition Regulations, is accomplished and penalties applied if appropriate.

[Whereupon, at 11:30 a.m., the hearing was adjourned, subject to call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

WEDNESDAY, MARCH 3, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

ARMY TACTICAL WEAPONS PROGRAM

The subcommittee met in executive session, pursuant to notice, at 9 a.m., in room 212, Russell Senate Office Building, Senator Barry Goldwater (chairman) presiding.

Present: Senators Goldwater, Warner, Byrd, and Levin.

Staff present: Francis J. Sullivan, minority staff director; Michael B. Donley, Robert S. Dotson, George K. Johnson, Jr., José E. Martinez, Carl M. Smith, professional staff members; and Tamara L. Jones, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Buzz Hefti, assistant to Senator Warner; Jon Etherton, assistant to Senator Jepsen; Frank Krebs, assistant to Senator Cannon; Gray Armistead, assistant to Senator Byrd; and Peter Lennon, assistant to Senator Levin.

OPENING STATEMENT BY SENATOR BARRY GOLDWATER, CHAIRMAN

Senator GOLDWATER. The committee will come to order.

This morning the Tactical Warfare Subcommittee welcomes Dr. J. R. Sculley, the Assistant Secretary of the Army for Research, Development and Acquisition; Lt. Gen. James Merryman, the Deputy Chief of Staff for Research, Development and Acquisition; and Maj. Gen. Louis Menetrey, the Director of Requirements, Office of the Deputy Chief of Staff for Operations and Plans.

Following a brief discussion on roles and missions, the Army has been requested to present their major tactical weapons program. A number of these programs have already been generously previewed for us rather inaccurately by the press, nevertheless, we are still interested in hearing what the Army has to say about them.

One issue of particular concern to the members of the subcommittee is the high cost of our modern weapons. We are producing weapons today that are not only significantly more capable than those they replace, but also much more expensive than their predecessors.

The responsibility for controlling the costs of these systems is a great one and I regret that our track record has not been the best.

We will expect the Army to address in detail today the costs, and particularly the cost growth associated with its major modernization programs. But to insure that the record is a balanced one, I want to make it clear that this subcommittee continues to support the Army's overall modernization program.

We heard yesterday a very sobering report from the Defense Intelligence Agency on the continuing strengthening of Soviet tactical forces. In contrast, we have an Army today that is equipped with weapons inferior to their modern and numerous Soviet counterparts.

We must surely tempt fate to allow this imbalance to continue.

Gentlemen, we welcome you this morning and you may proceed as you wish.

STATEMENTS BY DR. J. R. SCULLEY, ASSISTANT SECRETARY OF THE ARMY FOR RESEARCH, DEVELOPMENT, AND ACQUISITION; LT. GEN. JAMES H. MERRYMAN, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT, AND ACQUISITION; AND MAJ. GEN. LOUIS C. MENETREY, DIRECTOR OF REQUIREMENTS, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS

Dr. SCULLEY. Thank you, Mr. Chairman.

It is a pleasure to appear before you today to present an overview of the Army's research, development, and acquisition programs for fiscal year 1983.

Mr. Chairman, the committee has been provided with a comprehensive prepared statement and, with your permission, I would like to have it inserted into the record.

Senator GOLDWATER. It will be inserted following the testimony today.

[See "Equipping the United States Army," p. 2149.]

Dr. SCULLEY. With me today are Lt. Gen. James Merryman, the Deputy Chief of Staff for Research, Development and Acquisition; and Maj. Gen. Lou Menetrey, the Director of Requirements in the Office of the Deputy Chief of Staff for Operations and Plans; and also Maj. Gen. Larry Skibbie, Director of Combat Support Systems for General Merryman.

We hope that these sessions will provide you with a better appreciation of the basis for our budget request.

Following initial remarks by General Merryman and myself, General Menetrey will present an Army tactical warfare overview. He will explain how the Army is organized, why it is organized in this particular way and how we plan to fight based on such an organization.

General Merryman will then join General Menetrey to present a major system overview of our fiscal year 1983 research development and acquisition program.

The discussion will follow a mission area format in order to show the complementary nature of our battlefield systems. General Menetrey will lead off these discussions by describing a mission area in

terms of tactical operations and requirements; that is, what the threat is and how we fight.

General Merryman will then describe selected major system acquisition programs within that particular mission area.

The project managers of a number of these systems will be present to provide additional details as deemed appropriate by the committee.

After the mission area presentations, General Skibbie will present a brief overview of the tactical wheeled vehicle programs in the Other Procurement, Army appropriation which we refer to as OPA-1.

For your information in planning, we will cover the following systems during the discussion of the close combat mission area.

CLOSE COMBAT

M-1 Abrams tank; Bradley fighting vehicles; Apache attack helicopter; Scout helicopter; TOW antitank missile; and Hellfire antitank missile.

During the air defense and fire support mission area presentations we will discuss the following specific systems.

FIRE SUPPORT AND AIR DEFENSE

AIR DEFENSE

Patriot; division air defense [Divad] gun; and stinger.

FIRE SUPPORT

Pershing II missile; multiple launch rocket system [MLRS]; fire support team vehicle [FISTV]; field artillery ammunition support vehicle [FAASV]; remotely piloted vehicle; and copperhead.

We will then cover the Combat Service Support and the Command Control and Communications mission areas. The systems discussed in each mission area are as follows:

COMBAT SERVICE SUPPORT AND COMMAND, CONTROL, AND COMMUNICATIONS (C^3)

COMBAT SERVICE SUPPORT

Viper; Black Hawk helicopter [UH-60]; Chinook helicopter [Ch-47D]; high mobility multipurose wheeled vehicle [HMMWV]; and commercial utility and cargo vehicle [CUCV].

COMMAND, CONTROL AND COMMUNICATIONS (C^3)

Single channel ground and airborne radio system [SINCGARS] and position location reporting system [PLRS].

Today we are presenting you with a total budget request of $22.3 billion for procurement and R.D.T. & E. This sum represents approximately 38 percent of the Army's total budget.

FISCAL YEAR 1983 PROCUREMENT BUDGET REQUEST

[In millions of dollars]

	Fiscal year—		
	1981 actual	1982 estimate	1983 request
Aircraft procurement, Army	1,202.6	1,936.1	2,745.9
Missile procurement, Army	1,544.9	2,155.2	2,846.6
Procurement of weapons and tracked combat vehicles, Army	3,374.2	4,002.3	5,030.7

FISCAL YEAR 1983 PROCUREMENT BUDGET REQUEST—Continued

[In millions of dollars]

	Fiscal year—		
	1981 actual	1982 estimate	1983 request
Procurement of ammunition, Army	1,558.7	2,302.5	2,639.0
Other procurement, Army	2,841.3	3,725.9	4,567.5
National Guard equipment Army	0	50.0	0
Total	10,521.7	14,172.0	17,829.7

The major program areas of the fiscal year 1983 procurement budget request are shown.

Senator GOLDWATER. Would you show that slide again, please? What was the amount you spent in 1981 on National Guard and what do you propose in 1983?

Dr. SCULLEY. With your permission, General Merryman will respond.

General MERRYMAN. Senator Goldwater, it is my understanding that until 1982 there was no specific line for Guard and there is no money requested for Guard specifically in 1983. The reason for that, sir, is that the way our request has been put together and the way we assign equipment in the Army. It goes to units depending on their mission deployability. In other words, what I am saying, sir, is that if a Guard unit is going to go overseas ahead of an active unit, that unit is in higher priority for equipment than an active unit.

Senator GOLDWATER. Then in effect the Army supplies the Guard.

General MERRYMAN. Yes, sir.

Senator GOLDWATER. Then why would there be $50 million in there this year?

General MERRYMAN. You mean on the bottom line there?

Senator GOLDWATER. Yes.

General MERRYMAN. As I recall, there was a special appropriation for the Guard in 1982.

Senator GOLDWATER. That was put in by Senator Stennis.

All right, fine.

FISCAL YEAR 1983 RESEARCH DEVELOPMENT, TEST AND EVALUATION BUDGET REQUEST

[In millions of dollars]

	Fiscal year—		
	1981 actual	1982 estimate	1983 request
Technology base	509.1	586.7	699.7
Advanced technology department	159.4	210.7	314.5
Strategic programs	266.6	462.1	919.0
Tactical programs	1,568.8	1,573.0	1,679.0
Intelligence and communication	42.4	47.2	73.1
Defense-wide mission support	578.0	730.0	798.8
Total program	3,124.3	3,609.5	4,484.0

Dr. SCULLEY. The next slide then shows the fiscal 1983 Research, Development, Test and Evaluation appropriation request.

Senator GOLDWATER. What was "Technology Base"?

Dr. SCULLEY. This is literally the very basic or beginning research in areas that we feel in the Army have promise and future applicability to weapon systems.

I think it is important to briefly comment on what we believe the fiscal year 1983 request will accomplish. The Army has not had adequate funding for a number of years to fill equipment shortages, modernize and build sustainability.

President Reagan's and your actions to provide additional funds in fiscal year 1981 and fiscal year 1982 gave us our first real opprotunity to cut into these problem areas. With these funds we are buying more tanks, trucks, and air defense missiles, and we are doing so at more economical rates of production than in the past.

If we hold to economic production rates, the Army will get more for its dollars. The fiscal year 1983 budget request will continue that momentum.

We realize, however, that our ability to secure the quantities of equipment that we need at the desired rate depends upon our success in managing the dollars and programs provided us.

In closing I would like to spend some time on this issue. The Army is seeking to improve its ability to control program stability. There are of course economic, political, and technological factors which are beyond our control, but we can improve on management.

Some of the things we are doing include investigating ways to better discipline our cost estimating process, our fiscal management process and our program change procedures. These objectives are being pursued in management and cost discipline efforts which are currently underway throughout the Army.

Early in 1981 the Vice Chief of Staff, General Vessey, conducted a study to determine measures which could be implemented to better control costs. In July he directed the implementation of 22 specific actions. Some of the specific actions are: To establish uniformity in the application of contract inflation clauses; to tie the materiel acquisition decision process into the planning, programing, and budgeting system; require a formal system for the approval of configuration changes that drive costs——

Senator GOLDWATER. Let me ask you something. Isn't that one of your main problems, the design changes?

Dr. SCULLEY. Absolutely, sir.

Senator GOLDWATER. You are not the only service. That goes right through the whole Pentagon. Do you think you are making any progress in attacking that which has been going on since the days of George Washington?

Dr. SCULLEY. Yes, sir, I think we are making progress on this important cost driver. I think perhaps in the past we have strived almost to a point of fault to achieve technical excellence instead of fielding systems sooner. I think in striving for this excellence there has been an inordinate number of engineering changes on systems.

Senator GOLDWATER. Well, shouldn't research and development cover that problem?

Dr. SCULLEY. Ideally you would like to think it would, sir. I think realistically technology in fact changes so rapidly, and probably the

best example is in the electronics area, you have got a half life of about 2 years. On that basis alone R. & D. can't really predict the changes.

Senator GOLDWATER. Yes; this has been a problem. I know in the Air Force it is the most frequent reason for cost increases. I have never been able to understand why with all the money we spend on research and development, although I don't think it is enough, why you can't figure out the bugs in the laboratory or in tests before it gets out in the field and then you start making design changes.

I sure hope you can get hold of that because I think that once you solve that problem you would be in pretty good shape.

I don't know too much about ground weapons systems, but we talk 10-years lead time now in acquisition of airplanes. The Soviets talk 18 months to 2 years. Now they are not that much smarter than we are. Yet, they produce tanks and mobile battle equipment and put them in the field without all the trouble that we go through.

I don't like this idea of an industrialized America having to say to you that it will take 8 or 10 years to produce the first model. So I wish you luck in this. We will keep bugging you on it.

Dr. SCULLEY. Please do, sir. I might also add on changes that quite often they are threat driven. In fact, we will field the system, the threat changes and then we will need to modify a system.

Senator GOLDWATER. Thank you. You can go ahead.

Dr. SCULLEY. To require a formal system for the approval of configuration changes that drive costs; update on an annual basis major systems cost estimates; develop an Army-wide plan to improve costing methodology; develop a method to address the risk associated with the development and production programs.

Senator GOLDWATER. Let me ask you a question here. I saw in the paper I think this last week that the President is considering the appointment of a committee to help you fellows in this general area of acquisition. Has he done that? Have you heard about it?

Dr. SCULLEY. I have not, sir.

[Additional information follows:]

ACQUISITION IMPROVEMENTS

Dr. SCULLEY. Mr. Nofziger wrote to Secretary Weinberger, suggesting the establishment of a Blue Ribbon Business Panel to look for ways the Defense Department can cut costs. Deputy Secretary of Defense Carlucci has asked the Under Secretary of Defense for Research and Engineering, Dr. DeLauer, to form a panel. He is doing so now.

Senator GOLDWATER. Well, I have been trying to get that done now for 20 years. I thought I had finally found a President with a sympathetic ear.

I know I read that in the paper. You fellows better look that up because I know I saw it.

Dr. SCULLEY. We will be happy to do so.

Along these same lines, however, last September the Secretary of the Army, John Marsh, established the Cost Disciplinary Advisory Committee made up primarily of members from the private sector. Based upon their review, the committee concluded that most of the cost growth being experienced by the Army could be categorized into three areas. They are: Increases in the planned production

quantities; changes in technical or mission requirements; and increases in cost during the transition from development to production.

The committee also felt that the Army had formal change control procedures in the first two areas I have identified. Therefore, the committee concentrated most of its effort on the problems being experienced during the transition from development to production.

Some of the specific recommendations of the Cost Discipline Advisory Committee included:

First, the Army must deinstitutionalize the adversary relationships that have developed in the acquisition process. This includes relationships within the Army and between the Army and its contractors.

Second, there is a need for early identification of potential problems for senior Army leadership. We need to better use contractor-submitted production plans. They need to be tied to the design to cost reviews that we conduct.

Third, the Army needs to manage inflation on major programs instead of relying solely on macroindices.

Fourth, the use of letter order contracts should be eliminated or severely restricted.

Fifth, competition needs to be kept longer on major programs, certainly at the major component level.

Sixth, the relationships between the program managers and our commodity commands within the Army need to be clarified. This is particularly true in the production planning function and the use of production engineers that are currently assigned to the commodity commands.

Seventh, the Army needs to implement the management initiatives that have been identified and not study the problem further.

We believe that the actions we have underway to achieve better cost control, when coupled with other initiatives such as achieving program stability and multiyear contracting will greatly enhance the management of our acquisition programs.

We will further discuss the cost control measures we are taking during the discussion of specific systems.

In closing I would like to leave you with the thought summarized on the screen.

SOVIET PERSPECTIVE

We have done a great deal in the past five years by improving the equipment of our Armed Forces with the most modern arms and materiel . . . today our Army and Navy are, from the point of view of equipment, virtually new forces possessing great possibilities and capable of carrving out the most complex military tasks.—Marshal of the Soviet Union Kiril Moskalenko, Moscow, 1976.

The Soviets considered themselves to have a newly equipped Army some 6 years ago. Since then they have not slackened their investment in arms and equipment. Unfortunately, we have not kept pace. It is imperative that we do so now.

Mr. Chairman, with your permission, General Merryman will make some brief opening comments at this time.

STATEMENT OF LT. GEN. JAMES H. MERRYMAN, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT, AND ACQUISITION

General MERRYMAN. Thank you, sir.

Senator Goldwater, I am honored to be here in front of your committee: I especially appreciate your support.

I share your concern about what you are reading in the press and I believe our Nation deserves better. You certainly have a right to expect the best management possible from us and I promise you that you will get that.

I would like at this time, sir, for a few moments, if I may, to expand a little on what Dr. Sculley has said about cost growth.

Is it all right, if I stand, sir?

Senator GOLDWATER. Yes, it is.

General MERRYMAN. We have been trying to get a handle on this thing called cost growth and it is not easy. It is not easy because there are many contributing factors that I will discuss during the next 2 days that impact on cost control.

Let me describe what we have been doing in this past year to try to improve our cost discipline. I want to talk about how we define the problem and how we are attempting to attack it and what specifically we are doing about it.

COST DISCIPLINE—HOW ARMY DEFINED PROBLEM

Cost discipline working group: Formed by VCSA; 27 recommendations to improve cost discipline; and VCSA approved 20 actions, 22 July 1981.

Cost Discipline Advisory Committee: Appointed by SEC Army; five non-DOD personnel; and recommended 62 actions (including VCSA list), 16 December 1981.

USA/VCSA approved initiatives for implementation, 27 January 1982.

You heard Dr. Sculley describe that we had two groups put together, the Cost Discipline Working Group formed by our Vice Chief of Staff, an internal Army effort, and then the Cost Discipline Advisory Committee appointed by the Secretary of the Army. This committee included many capable members from outside the Army.

The point here is that you have a united effort in the Army. The recommendations of these groups have been approved and we will implement all of them by June.

Together those two groups decided what we need to do to attack the problem. They identified these measures.

One, you need more program stability. You have to have more management information. You need better and more frequent estimates. In the past we have only done them at major milestones, but we have learned that that is not often enough, and I will expand on that in a moment.

We need to get smarter and learn how to do better transition from development to production. We do development pretty well, but it is when we go into production that difficulties arise.

We need to tie our decision process into the budget. We need our PM's to determine for their specific program what cost control measures are most appropriate and that needs to be thought of up front.

Then last of all, of course, we need to follow up to insure compliance.

COST DISCIPLINE—WHAT ARE WE DOING?

Program stability: Long range RDA plan; Stable program list—M-1 tank, FVS, Blackhawk, and CH-47D Mod.

Multiyear funding: MLRS, Blackhawk, ALQ-136 Jammer in Fiscal Year 1983; identifying candidates for fiscal year 1984.

Program management control system: Increase discipline in materiel acquisition process; increase visibility of program trends; and identify need for aggressive management.

Stability a major consideration during POM building.

Now taking each one of those points, what have we done about program stability? The Army has developed a long-range research development acquisition plan. I don't know whether you have heard of it before, sir, but we have the program objective memorandum [POM] that you are familiar with, and then we have a thing called the extended planning annex [EPA] which is 10 years past the POM.

In the past, this 15-year period has not been looked at as totally fiscally constrained. That is because there is no real way to fiscally constrain yourself beyond the POM years, but you can make a judgment as to how much money you think you are going to have out there based.

This plan is based on the user, TRADOC and the Deputy Chief of Staff for Operations, determining where they are and where they ought to go after the Chief of Staff issues his guidance in order to develop an Army with certain capabilities.

The second point is self-explanatory. You have got to stabilize your programs.

We have come up with four programs that we call stabilized programs. Later we will probably come up with more.

Now let me comment a little bit upon that.

Multiyear funding has been commented on. I might add that in addition to what you see there, we are also going to try to go with the CH-47 in 1983.

The program management control system that the Commander of DARCOM, who heads the organization that buys all of the Army equipment, is implementing will place some discipline into the management process.

Last, our POM building stability has got to be a major consideration. What I am talking about are those programs that are currently in development, or in procurement, must receive preference before we bring other things along, unless the other things have a higher priority.

BETTER MANAGEMENT INFORMATION

Before—infrequent reviews, lack of management data between reviews.

Now—monthly report prepared by PM: Provided to senior army leaders, early information on cost and management problems.

Establishment of cost risk team: Assess cost risk on systems nearing milestone, advise ASARC.

Quarterly reviews by senior managers: Review contractor cost performance data, identify potential problems.

Better management information. In the past we have had meetings. The senior management of the Army has always been involved. What we have learned, Senator Goldwater, is that we haven't been involved perhaps to the extent that we should and

that we didn't know as much as we ought to have known and that we didn't get information in a timely fashion so that we could do something about it.

What are we going to do? We are now requiring a monthly report by the PM that will come up to the leaders in the Department of the Army. We are establishing a cost/risk team.

Now what I am talking about here is that prior to the Army System Acquisition Review Council [ASARC], the body in the Army, sir, that you probably know that sits around the table, three and four stars, and the Secretary, who decides if we are going to go with the program or not.

This team will be established of cost experts. They will go out, like they just did last week, for example, on the DIVAD gun, and look at all the aspects of that procurement prior to the Army's decision to commit to production. They will come in, talk to me and the Vice Chief of Staff and say the estimates are correct and, if it looks like the DIVAD program can proceed into production at the desired rate, go for the dollars we currently have in the budget. If not, they suggest what we should do.

The last thing is quarterly reviews by senior managers who will look at the contractor cost performance data that is submitted monthly so that we can identify potential problems.

BETTER AND MORE FREQUENT ESTIMATES

Before—baseline and independent cost estimates for milestone reviews only; normally accepted updated PM estimate for budget; built-in inflation problems.

Now—annual independent estimate of major systems; compare independent to PM estimate: use highest estimate for costing and budget; comprehensive plan to upgrade cost analysis data base; developing specific system unique inflation indices.

We need better and more frequent estimates. As I indicated earlier, what we have been doing in the past is developing baseline and independent estimates developed at major milestones only.

Now you could ask me why didn't you do it more often? One of the problems is manpower. Another problem is ability. But we have learned that the way we have been doing business in the past is inadequate.

Senator GOLDWATER. May I interrupt you?

General MERRYMAN. Certainly.

Senator GOLDWATER. You of course have program managers on all your major systems. How closely can he tell the Army that there will be inflationary increases in the systems? Does he know well enough ahead of time to tell you?

General MERRYMAN. As far as inflationary indices, sir, he does know some things better than we do. How far ahead, I am not sure. Let me give you an example. Take a PM who is working with a company on the west coast versus a PM who is working with a company in Alabama where I just came from. The PM in Alabama knows he has got something going that is good and the one on the west coast knows he has got a problem that regards how far his money will go.

I can give you another example. It doesn't tie into procurement, but if you go back to the old Capehort housing bill, you remember back in the late fifties that provided the Army about $15,900, as I recall, to build a set of quarters, and they gave that across the

board to all the Army posts. Well, the Army post at Fort Rucker, Ala., which I just commanded until last year, found that with those dollars you could build a carport, put a driveway in and you could put washers and dryers in the kitchen. If you go up to Fort Knox, for example, that same set of quarters—$15,900—has no carport and no washers and dryers. If you go up on the east coast you probably don't even have a driveway.

So inflationary conditions are different, and from that aspect the PM does know. What he will be able to provide us in his monthly reports are the things we don't currently know about, such as what is going on out there as far as his particular program is concerned.

I might also add, because I want to be totally honest with you, sir, that we don't know at this stage all we are going to get from this. The program starts this month. We don't know how successful it will be. We do know what we have done in the past hasn't been successful. So this looks like it is worth trying.

Senator GOLDWATER. Let me ask you a further question. Let's take the new helicopter, the Hughes helicopter, because we are having a little discussion on that now. How far ahead was the Army manager able to tell you that there would be a cost increase? I am interested in that because when I first saw the program and flew the helicopter, it was just about a year ago, and you were talking costs then of around $7 million. Did it suddenly turn up to be $15.8 million, or did you know about it all along?

General MERRYMAN. No.

Senator GOLDWATER. Did you do anything to try to slow it down?

General MERRYMAN. No. I can give you my perspective and I have the PM here who can add to it later on.

If you go back to a year ago March 19, I testified before the House with the PM standing at my side. As I recall, we told the House that as far as we knew the dollars in the budget would be sufficient. That was an honest absolute statement.

Subsequent to that, and I am not sure exactly when, we got the first indications that we might have a problem. I think it was in the late spring, as I recall. I believe that I recall seeing testimony somewhere, sir, around June of last year where the PM started to say it looks like we are going to have a problem.

Now you might say, well, why didn't the PM blow the whistle or come up here and talk to people? The reason for that, sir, I think is fairly simple. What was taking place then was the PM and the company were going through a baseline cost estimate and they were trying to determine where they were.

Now after they decided where they were, Senator Goldwater, the PM then had to get with DARCOM commanded by General Keith and find out if he agreed with where they were. He next had to come to DA to find out if we were all in agreement. In November, DA had an ASARC, at which time we decided that the PM's number in our judgment was low. You will remember our special hearing, so we added a half billion dollars to the PM's program subsequent to that, and subsequent to the Army's deciding what the real number was, then the number was submitted to Congress.

I discussed this, sir, with your staffers and I discussed it, incidentally, for your information, with the staffers of other committees. Dr. Sculley and I, as well as the rest of the Army's leadership, were

determined to be forthright, open, honest, and let you know everything we knew. I don't want to have any secrets and he doesn't either.

The question comes in, when do you really say anything? I shouldn't walk over here or have a PM walk over and say, Senator, you know, we have got a problem or it looks like we have got one, which may be resolved shortly thereafter.

So it is a judgment thing. I think we have got to improve upon what we have done in the past, but it is still not clear cut, sir.

Senator GOLDWATER. Well, I think the earliest you can inform us the better off you would be. I find these manufacturers get a little bit squirmy if they know or think that the services are reporting to the Congress cost increases that we generally didn't know about until the next budget.

I am hoping that all of our committees will pay very close attention to this and we expect from the manufacturers complete justification on their part as to why these things are going up. I am not blaming the Army.

I am simply asking you not to hesitate to call any member of the staff or me or any Senator on the committee and tell us you have a problem. Then we will go to work.

General MERRYMAN. I promise you my support and I know that I can speak for Dr. Sculley.

Senator GOLDWATER. Fine.

General MERRYMAN. Sir, the last part of this slide is what we are now going to do.

We are going to conduct annual independent estimates. We are going to compare the independent estimates with the PM's estimate, and in budgeting for a particular program we are going to use the higher index, or the higher estimate, unless there is some peculiar reason that the Secretary of the Army should tell us that we shouldn't.

We are going to upgrade our cost analysis data base so that we can look toward developing specific system unique inflation indexes, because this is absolutely necessary if we are ever going to get a handle on telling you what the real cost is going to be.

This, of course, is going to require OSD and OMB approval, and I can't speak for what will happen there, but that is going to be necessary.

BETTER TRANSITION FROM DEVELOPMENT TO PRODUCTION

Before: Insufficient emphasis on transition, consistently experienced cost growth.
Now: Attempting to define production risks, Developing method to translate risk into dollars, Improving production engineering capability.

As far as better transition from development to production, the point I made before, sir, is that we have had insufficient emphasis on transition and now we are going to try to improve it.

I want to be honest here again and tell you this is not going to be the easiest thing in the world either. One of the problems is that we do not have sufficient people in the typical PM's office that are production experts. That is because the PM who is in R. & D. has been spending most of his focus on R. & D.

I should also say that the Pentagon does not have an excess of production experts. They are hard to come by. From what I am

told, the amount of dollars that they require to be hired makes them tough to find. But we are going to attempt to do that because it is absolutely necessary if we are going to get a handle on how we move into production and to come up with more accurate costs.

TYING DECISION PROCESS TO BUDGET

Before: ASARC and budget process not tied together, ASARC, decided on quantity and cost, and budget process based on dollars available, sometimes not enough.

Now: If system comes to ASARC with dollar problem—senior managers must identify trades to pay for program, ASARC decision is integrated into budget/POM.

What I am getting at as far as tying the decision process to budget, sir, is this. The Army's process until recently had two channels, if you will. One was an ASARC process which was a body that would sit there and decide whether we would go with a given system. At the same time that the ASARC was taking place we had a budget process, which was driven of course by the budget and what takes place here and at the White House during the budget year.

In the past an ASARC made a decision that we would go with a given system. Subsequently we would find that something in the budget process would dictate the dollars weren't there. So by the time we came around to funding, we had to change a program that we had already begun.

What we are going to do in the future is that when we conduct an ASARC and the program is brought before the ASARC Chairman, and that is the Under Secretary and the Vice Chief of Staff, a decision will be made right there. In other words, if we are going to go with that program and it requires so many extra million dollars, we are going to identify where those dollars come from and tie those two programs together.

As a matter of fact, the first program that we did that with was the AH-64 and we provided you a list, sir, of where we got the money to add those extra millions of dollars.

INDIVIDUAL PM INITIATIVES (SYSTEM UNIQUE)

Productivity gain via manufacturing methods and technology.
Value engineering contract incentive.
Design to cost contract incentive.
Competition for major assemblies.
Goverment furnished material (breakout).
Continued should cost studies.
Reduction in cost plus contracts.
More frequent cost performance reviews with contractor.

My final slide here is to show you that the top can't do it alone. What this slide emphasizes is that each PM must do his own thing right. Each PM has got to look at various things like some of the things I have listed here.

The productivity gain you can get out of using manufacturing methods and technology results from doing things better and simpler.

Value engineering and contracting incentives are techniques whereby the PM and the company can get together to figure out a smarter way to do something, and the company and the U.S. Government share the savings.

Design to cost is self-explanatory.

Competition for major assemblies simply says you don't go with just one major assembly manufacturer. If you need an engine you try to go with two or more sources. In many cases the Government can provide an assembly or component of a system to the prime contractor rather than looking at the prime contractor for buying each one of the parts. When the prime contractor buys a part, as you can imagine, sir, he adds a charge that we can avoid if the Government furnishes it.

We are going to reduce the number of cost-plus contracts and try to use fixed price contracts where possible.

Finally, as I have alluded to earlier, we are going to have more frequent cost performance reviews.

In closing, sir, all of the initiatives directed by the Chief of Staff and by the Secretary of the Army will be put into implementation by June. There will also be a monthly progress review by the Army's top leaders. These sessions will include the Inspector General of the Army, the Vice Chief of Staff and all the Army staff principals.

OFF THE SHELF BUYING

Senator GOLDWATER. Let me ask you or anyone with you, what is the policy of the Army in off-the-shelf buying? Now, I am thinking particularly in terms of purchasing a training airplane. We are having a little problem in the Air Force right now, and I don't know whether it is across the board or not. The manufacturer has manufactured on his own a training plane but the Air Force will not buy it because it is off the shelf and they want competitive bidding on it. I don't mind the competitive bidding, but to eliminate a manufacturer because he developed something on his own I think needs some looking at.

Is that the policy of the Army, too?

General MERRYMAN. The policy of the Army, is that wherever we can do that and meet the requirement, we do it. Now how well we have done it across the board, I would be less than honest with you if I told you an answer because I don't know.

I can speak to aviation somewhat, though, since that is my primary background. If you will remember, we used instrument trainers provided by Cessna. We bought some Beech aircraft off the shelf to have instrument training at Fort Rucker. All primary helicopter training is accomplished in off-the-shelf Hughes helicopters.

Later today, I am going to brief several systems that we are going to look at for the off-the-shelf procurement. For example, a vehicle called the HMMWV and a CUCV: a High Mobility Multipurpose Wheeled Vehicle and a Commercial Utility Cargo Vehicle. The CUCV will be essentially a commercial off-the-shelf vehicle, and there will be other examples I will tell you about, sir, as we proceed.

Senator GOLDWATER. Well, thank you very much for that presentation. I want to thank the Army for taking these steps.

General MERRYMAN. Thank you, sir.

Senator GOLDWATER. They are long overdue. We really have to get hold of these costs. I am not speaking as a rabid cost cutter.

[Discussion off the record.]

Senator GOLDWATER. On the cost increases, if we can slow down or stop, we could get more equipment and that is what you need.

Senator Warner.

Senator WARNER. Senator, I just would have an observation concerning your phrase, "these measures are long overdue." You have been here far longer than I have, but I was on the other side of the fence for a while. Your predecessors were men of equal good intentions, and I don't mean to indict them for their failures, but we have had successive generations of persons with the quality and the good intentions the same as yours who have not been able to cope with the problem.

I wonder why we have reason to believe that all of the sudden we have now put together a team that is going to do it.

General MERRYMAN. Senator Warner, that is certainly not the message that I am trying to convey.

Senator WARNER. I know you weren't imparting it because I was very much impressed with your predecessor. I thought that he was an outstanding individual. Where is he now?

General MERRYMAN. He is Commander of DARCOM now, sir.

Senator WARNER. He did his best to get this situation straightened out.

General MERRYMAN. That is correct, and still is, as a matter of fact. In other words, what you are seeing here, a lot of this is his. If there was ever a right guy for the right spot, it was General Keith, and he is the man you are talking about.

What is happening here, Senator Warner, is that each year I guess you get a little smarter. Each year a new problem raises its head. We are faced with the same problem over there that you all are. Everybody is working about a 14-hour day trying to figure out which things to juggle and why. What I am really saying here is that based on what is happening with all of these cost increases, we are going to try to juggle our time a little differently to spend more time on certain things in the future than we did in the past.

Another thing that has happened to the Army that I really ought to emphasize, is that during the past 10 years we didn't do much about modernizing. Our efforts were oriented toward R. & D. Now all of the sudden, the bushel basket is falling upon us and many systems are coming into production. Far too often during this transition from R. & D. we are seeing cost increases. We aren't going to solve this problem overnight. It will take time and effort. I don't know what our success rate will be, sir.

Senator WARNER. We also have, Senator Goldwater, the influence of PMI here. They have been lean and mean years. Let's see if that influences the cost any.

Senator GOLDWATER. All of the services can be of great help to us because we are faced with a Congress that really does not have a grasp of the military problems. When we realize that for over 20 years we have not been spending enough for defense and then we are faced with a huge deficit and a tremendous budget and a growing clamor across the country to cut the military. We listened to the President yesterday saying he is not going to cut the military and I am inclined that way. I don't know where we can cut it unless you fellows can keep digging in and digging in and telling us "We think this, and we would like to see you do that." If we can

work as a team, I think we can get some things done, because we have got a problem.

Senator WARNER. May I make just one other observation to follow on to Senator Goldwater's. The media really turned on us. I am not just pointing to them, but how many of you saw that CBS program the night before last on the tank and the bulldozer?

General MERRYMAN. I heard about it, sir. I didn't see it.

Senator WARNER. Get your public relations people to show it to you because it is quite dramatic.

One of my colleagues, who will remain unnamed, turned to me and said, "You know I fought with Patton. We never had a bulldozer when we raced all the way across Europe. What has changed in tank warfare now that we suddenly have to have a bulldozer?" I have to answer that question and I don't know what the answer is, but I am going to search it out. Is there a tanker in the midst?

ARMORED COMBAT EARTHMOVER

General MERRYMAN. You don't need a tanker to answer this one, in all honesty. As long as we have had tanks, blades have been available in tank companies to push rubble around and to do minor earthmoving in loose soil, but you are not going to dig very much.

We need the armored combat earthmover that is called the ACE. People have remarked rather flippantly about the ACE at times, and it distresses me. We need the ACE for far more than digging in a tank. The reason you are hearing about the ACE being required to dig in a tank is that the Army has done an analysis that shows that, in a typical defensive situation, if the tanks are dug in, they live a lot longer, which results in a large monetary saving. Thus, the ACE pays for itself in just a few short battles.

But the other thing it doesn't address is that we need some armor protection for a bulldozer if we were to fight another war. Let me give one example.

Senator WARNER. I didn't mean to uncork the bottle here. We will cover that. I am just pointing out the practical problems that our colleagues who are not involved daily in defense, as the Senator and myself, see these little things and recall their own experiences with the Armed Forces. They come to us and ask these tough questions and it is our responsibility to answer them.

I learned yesterday that the Soviets incorporate a blade with their tanks.

General MERRYMAN. We heard that yesterday, Senator. But we have chosen to go the alternate route of a separate vehicle infantry tank.

Senator GOLDWATER. The bulldozer won the war in the Pacific.

Senator WARNER. Oh, really.

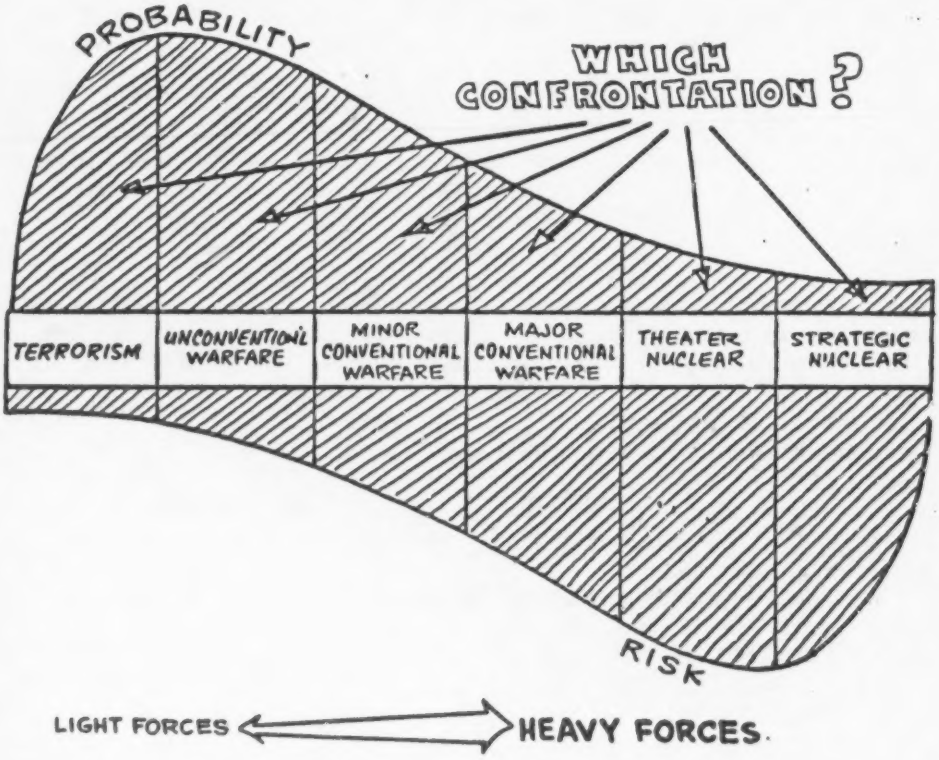
Senator GOLDWATER. Yes. [Laughter.]

Even the Navy used them.

Dr. SCULLEY. Mr. Chairman, with your permission, sir, at this time I would like to introduce General Menetrey to give you a tactical overview of why the Army is organized the way it is.

STATEMENT OF MAJ. GEN. LOUIS C. MENETREY, DIRECTOR OF REQUIREMENTS, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS

General MENETREY. Sir, it is a pleasure to be here and talk about one of my favorite subjects which is how your Army fights.



Of course, what confrontation or what war should we be prepared to fight? The purpose of the Army, as the other armed services, is to deter war and it is not to fight war. The only way to do that is to be able to fight if you have to.

You can see that. It is across the spectrum of conflict. Which confrontation and the probability is not in association with the risk. Needless to say, the higher risk then the higher order of conflict.

Across that spectrum we have to have forces configured to meet each of those different types of warfare, and that goes from our light forces to our heavy forces, and I will talk more about that as we go along, the total spectrum of the Army land combat capability envisioned or encompassed within our force structure.

Senator GOLDWATER. Let me ask you a question. Does that curved line at the top indicate the degree of importance or probability you put on each? Terrorism seems to be very high.

General MENETREY. Yes, sir, this is just notional, but generally the probability of this occurring at this end of the spectrum, terrorism, unconventional warfare, and minor conflict, is much higher. But the risk to the United States and to the interests of the United

States is certainly less at this end than it is if you get over into major conventional warfare or theater nuclear or one of the others.

So in balancing probability against risk within a force struture and within the equipment for that force structure is one of the problems that we share, sir, with you and your committee.

That is just to say that we have to be prepared across the spectrum. We cannot afford to concentrate on any one of those types.

Looking at what would be the highest risk kind of conflict against the Soviet Warsaw Pact in various places, particularly Europe, major conventional, theater nuclear, we have to look at the Soviet attack doctrine, and I know you have had plenty of briefings on this and I am not going to go into it. They concentrate on mass and continuous operations. They have the equipment and the organization to support this concept, massive numbers of tanks primarily.

They also support this concept with an echelon concept. That is their first echelon, and this is at every level of their organization, regiment, division, front, every level, they have a first echelon, which is to attack and destroy the integrity of the defense, beat down the defender and keep him from responding and then to exploit with their second echelon in a massive kind of way to maintain the momentum and speed of their attack and to attack for deep objectives.

They have espoused this for years and practiced it. We have watched them train and practice and we are pretty sure this is what they intend to do.

From our Army perspective, everything goes back to doctrine. In other words, we have a concept, we figure out the threat, how to respond to that threat, how to win against that threat and we embody that in our concepts and in our doctrine and from that doctrine flows our organizations and equipment requirements.

We currently call this the air-land battle, and I am sure you have heard of this and probably had it explained at length. The name is important. It is a combined air-land battle. It is not merely a land battle. We cannot fight it alone. It is embodied in our field manual and other doctrinal publications, particularly this one, FM 100-5, and it essentially says how we intend to fight.

Senator GOLDWATER. Let me ask you a question. I understand General Starry is rewriting it.

General MENETREY. General Starry has left TRADOC, sir.

Senator GOLDWATER. This is about to be published?

General MENETREY. That is correct. It has been written and it is about to be published.

Senator GOLDWATER. He has made some rather substantial changes.

General MENETREY. Yes, sir.

Senator GOLDWATER. I understand one change, and it may be just a recommendation, but I think it is a very wise one, that the Army keep the American public informed of everything they are doing. They should not operate in a secluded or semisecret way unless they have to. Any changes in battle order or equipment or personnel, which can be briefed should be briefed.

I think General Starry's reasoning on this was very sound. I went down to visit with him when he was at Fort Monroe. There

will be no more Pearl Harbor wars and we will not have a citizenry ready for war. However, they will be more ready to understand a war if they have been kept up on the reasons for the Army and the Air Force and the Navy and the Marines doing certain things in their changing of their tactics, equipment, and so forth.

I am very anxious to see that. That should be out in print very soon, shouldn't it?

General MENETREY. Yes, sir, in May. It has been distributed widely in draft.

Senator GOLDWATER. It will be a pleasure to see something new. I think I studied that when I was studying military a thousand years ago. I never will forget General Patch was my professor of military science and tactics. We would fight that battle of Gettysburg and he knew every grain of sand on the table. [Laughter.]

He was a major then and I said "Major, how can you tell me that my decision is right or wrong?" He said, "Sonny, you will never know until they start shooting at you." [Laughter.]

I am glad they are changing.

General MENETREY. Yes, sir, unfortunately, that is right. We will just do the best we can and put the best brainpower we have got on it.

I am going to talk a little bit about that and I am going to go rather rapidly because I believe you are familiar with it in a general sense. If you look at the Warsaw Pact kind of offensive maneuver that we discussed with the first and second echelon, we must be capable of defeating that first echelon, that is stopping them and then simultaneously attacking the second, and I will talk about why.

In order to do that we have to find them, see deep, we have to locate, identify, track and target that second echelon, the deep echelon, and that requires of course intelligence systems in order to do that, both Air Force and Army primarily and the Navy if the Navy is involved.

In order to hit them at great distance, our primary need currently, certainly and probably for the future is battlefield air interdiction, the Air Force air interdiction, and we depend on that primarily. But it is also surface-to-surface missiles and within range of our artillery systems to include our longer-range and newer MLRS, multiple-launch rocket system.

AWACS TRACKING

Senator GOLDWATER. How important will AWACS be in that?

General MENETREY. Sir, AWACS currently tracks air targets and not so much ground targets.

Senator GOLDWATER. But they can?

General MENETREY. If they change the gates on it and so on. There are systems coming along which could do that, to include the moving target radar kinds of systems being developed. Both the Air Force and Army are developing certain of those. But AWACS, as you know, is primarily against the air target. They are looking at helicopters so they can detect helicopter employment which would be part of the ground forces.

That includes electronic warfare. It also includes raids, if you will, by special operating forces, air mobile and air assault raids and perhaps attack helicopter raids back against the second echelon.

So we have to develop ways of attacking that echelon at depth in the battlefield, and that is our extended battlefield, part of this air-land concept.

Why do we want to attack that echelon back there? This is a simplistic chart, [chart deleted] but if you look at the enemy front-line strength over time as he plans it, he plans on maintaining constant pressure, momentum and mass against your forward line of contact, your front line, and he can do that and that is the top line.

If you can interdict the second echelon and slow that momentum, you then decrease his frontline strength and give yourself over time what we call windows for action. It is really time to take the initiative to attack the enemy and to use your maneuver instead of just withstanding his assault and using your firepower.

This is very important that we do this. It is important that we not only do it, but we know when it is going to happen, we know what targets to hit at what time and that the ground commander, particularly the corps commander plan this. How deep? How long? Maybe 72 hours in advance. He has to be able to plan that this will occur so he can initiate his action, his attack, his maneuver and take advantage of that opportunity.

That is the key part. If you are going to fight outnumbered you are going to have to control the battle and use initiative. You cannot just withstand the enemy attack. You have to control that battle.

See deep, move fast, strike quickly and finish rapidly before the next follow-on echelon comes on because we are outnumbered.

These are the critical tasks as we see them.

I will talk a little bit more about this when we get into the weapons systems because it is the systems that allow us to do this, continuous battle, day, night and all weather, and other things that are on the highly lethal battlefield.

Of course, our ability to get somewhere and to strategically deploy is important. I know in the past we have seemed to perhaps overemphasized defense. We are now seeking to emphasize maneuver and the offense because we have to have the initiative if we are going to control the battle.

HEAVY DIVISION

I would like just briefly to talk about two types of organizations which are typical, the heavy division which is coming in about 1983. These are armored and mechanized infantry divisions comprising about two-thirds of our division strength in the Active Forces. They have been designed to take advantage of those concepts I talked about, our new systems coming on, and to be within personnel strength resources that we can afford.

Senator GOLDWATER. What would be the personnel strength of a heavy division?

General MENETREY. Currently in Europe the heavy divisions run about 17,500 on the ground. This one will be somewhere between 18,000 and 19,000. The exact number has not been decided. There is a meeting, as a matter of fact, with the Chief of Staff on Friday where this is going to be discussed. But it will be between 18 and 19 thousand.

Senator GOLDWATER. What is the personnel strength of the average Soviet division now?

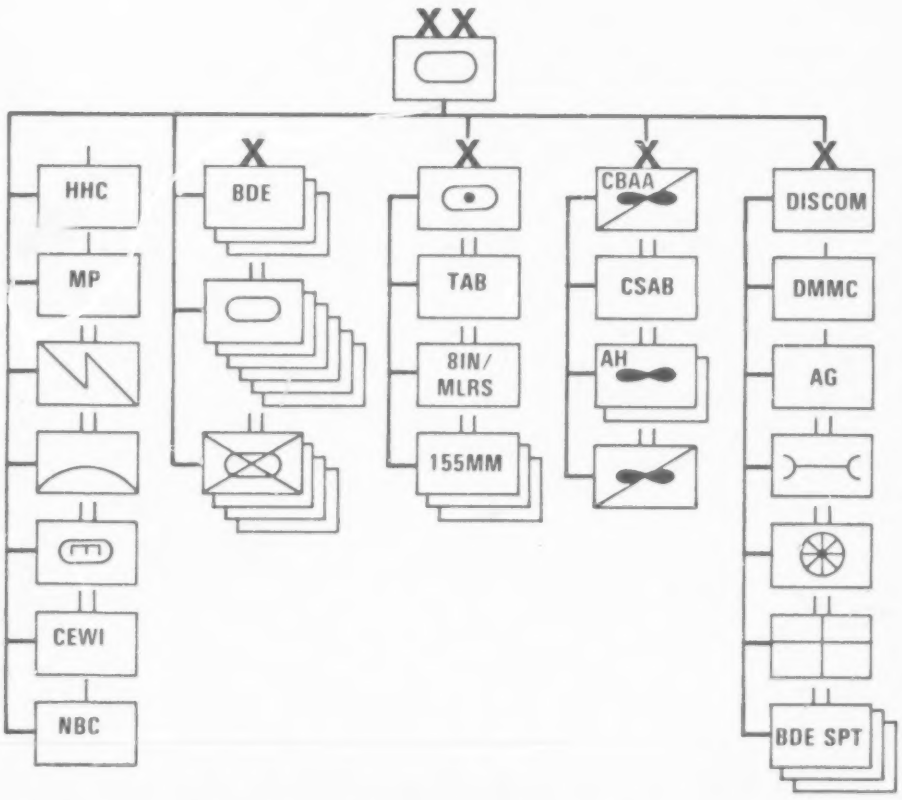
General MENETREY. Depending on what kind of division, motorized, rifle or armor division. Their tank division, as they call it, is between 10 and 13 thousand. They are increasing their strength, as you probably got in the DIA briefing, over time and putting more elements in their divisions, but it is between 10 and 13 thousand currently.

The heavy division, again our armored and our mechanized infantry divisions, were redesigned on these principles.

Now the combined maneuvering capability I was talking about, more tactical battlefield maneuver. These higher priced but also more sophisticated and far more capable weapons systems require a greater leader to led ratio, similar to the Air Force.

Arm, fuel, fix, feed forward, keep those more capable systems in the battle longer by supporting them better. Again, continuous combat, and not just night combat, but day, night and all weather.

DIVISION 86



This is a busy chart and I will just mention it. It is the standard wiring diagram of any military organization.

I just want to point out a few things. This is an armored division in the new divisional structure. There are some things that are different. I said we had to see deep. A new combat electronic warfare intelligence organization or the consolidation of previous organizations will allow us to concentrate on that intelligence task.

An NBC, nuclear biological chemical company, to look at the integrated battlefield aspect.

We have changed the organization within tank battalions and mechanized infantry on that leader to led ratio I mentioned. For example, there are four tanks in a platoon instead of five, but there are four companies in a battalion.

The M-1 being fielded now, there is a battalion at Fort Hood and a battalion in Europe. They are organized in this structure, with four tanks in a platoon and four companies in a battalion. This organization is to take advantage of the capabilities of the M-1 tank.

All units as the new equipment comes on board, will be organized in that manner.

More artillery, primarily by increasing the number of tubes in a battery.

Consolidation of the aviation assets into one structure, a brigade level structure.

Brigade support battalions in the support units. It is a fix forward, to move forward with the combat elements. Those are the major differences.

When we look elsewhere in the world, contingency areas, we get the light forces primarily. The heavy forces are still necessary, and still must be deployed where required. So we have to look at our light forces. These are some of the things we are looking at and some of the characteristics we would like to emphasize.

Now, out at Fort Lewis, as you know, sir, we have something called the high technology test bed and they are seeking to evolve to a high technology light division, the 9th Division at Fort Lewis. This is the prototype for our infantry divisions.

We are also seeking improvements in our airborne and our air assault divisions, we have one of each of course, the other part of our light forces.

I would like to look at the effort going on at Fort Lewis just briefly because that is the prototype.

It is oriented on the Middle East, although it is going to have application throughout any area of the world where we might have our national interests threatened, but it is oriented on the Middle East.

What is different in the Middle East? Well, there is a lot of territory, a lot more than Europe. So there is less value territory. The forces-terrain ratio is less, fewer forces, more terrain.

MANEUVER AREA

You are going to have to maneuver in that kind of terrain. You cannot wait for an attack. You have to go to great depths. You have to attack as well as defend. The threat is different, the terrain, climate and logistics is a real problem. There are few roadnets, lines of communication. Logistics is a real problem.

So we are taking the infantry division, like the 9th Division, the 25th, the 7th, and so on, and we are seeking to change it so that its combat power will more closely approximate the heavy division. You probably never get there in terms of firepower and survivability because right now we are not planning on any tanks in that division, but it will get as close as we can. We might be able to exceed the combat power of the heavy division in tactical mobility, maybe command and control and intelligence gathering and so on, and we will seek to do that.

At the same time, strategic mobility is a major consideration. We want to keep it as close as we can to the current infantry division, the light division, and sustainability, the same way. So that it is easy to logistically support in a contingency area. That is the effort going on.

Just a quick look at the deployability.

AIRLIFT REQUIREMENTS

	C-141B	C-5A
Heavy Division 86	1,207	781
Air Assault Division	952	208
Airborne Division	908	77
Current 91D	859	99
HTLD target	1,000	0

Deployability is stated in terms of C-141B equivalence. Of course you know the Civil Reserve Air Fleet and so on, these are just equivalencies.

This is what it looks like in different kinds of divisions. This is the high technology light division. We are seeking to orient them out of C-5s and into C-141B equivalence. That will include a lot of the Civil Reserve Air Fleet.

Senator GOLDWATER. Could you explain that a little better. Airlift requirements, heavy division 86. Is it 1,207 aircraft or 1,207——

General MERRYMAN. Sorties.

Senator GOLDWATER. Over what time?

General MENETREY. I am sorry.

Senator GOLDWATER. What time period does that cover?

General MENETREY. However much time it takes to generate the sorties. In other words, that is the total sorties required. The Air Force would generate the sorties if they had that number which is quite a lot over some period of time.

Senator GOLDWATER. Is that for the Rapid Deployment Force or is it just a general war situation? Are you talking about the Middle East now?

General MENETREY. Yes, sir.

Senator GOLDWATER. How long would you anticipate it to take to move a division from the United States to Saudi Arabia?

General MENETREY. Needless to say, sir, as you can see, it would depend on the kind of division and it will depend on the sortie rate the Air Force can generate. But you look at something like 8 days perhaps for the 82d Airborne Division, something like that. But it depends on the sortie rate, sir. You would have to go in with what number of aircraft and what type of aircraft, as you know better than I, and the number of sorties that can be generated over time. That depends upon their refuel capability and so on.

So you have to establish your parameters before you give the answer to that question.

Senator GOLDWATER. You say you can figure close to 8 or 10 days that you can get them there?

General MENETREY. From the Army's viewpoint that is no problem. The problem is at the Air Force end in generating the sorties. We can be ready to go in far less than that, as you know.

Senator GOLDWATER. We will get you there.

General MENETREY. Yes, sir. And when we get there, sir, we will take care of it, whatever it is. We are looking at getting a lighter division out there or at least one that is close to the current infantry division.

How are we doing that? Several ways. Not only new equipment, and you mentioned off the shelf. A very heavy amount of the equipment being looked at out there, the so-called high technology equipment, is off-the-shelf equipment. I know some of the people from the committee and your staff have been out there, and they are looking at a great deal of that off-the-shelf equipment.

Training is very important. You know, if you are going to fight differently you have to train differently and we don't emphasize that enough sometimes. The training is how the soldier is able to do it. We could probably make more money that way than in many other ways, in better training.

Well, I want to keep going. Next.

It is a very complex world out there in a land battle and everybody appreciates that, complex certainly than other kinds of things you might be doing. Keeping track of all that, as General Merryman mentioned and Dr. Sculley, we sort of do it by mission area. That is what I would like to get into now to lead into the first equipment explanation we have coming up.

We will look at these mission areas. There are 13 mission areas altogether. These are the things that have to do with the Army in the field, and those are the ones we will be looking at over the next couple of days.

The first one is close combat, and close combat is light and heavy, like light units and heavy units. There are different kinds of close combat. The infantry fights in the woods, in the jungle, in the mountains and so on. Armor fights on the plain or the desert.

In the close combat area these are the kinds of things you do at the lower level. It gets right down to basics. You destroy, capture, and repel and you don't have too much time to argue and you don't get too much finesse. Those are the kinds of things you do, and that is what you have to do it with, fire, maneuver, and control.

Remember that first echelon engagement. That is the close combat area and that is what we are talking about. It takes everything we have got to stop that first echelon, including artillery and close air support. But the close combat is our direct fire weapons, and that is our tanks, our fighting vehicles, our TOW's and Dragons, and when it gets close in it is an infantry fight just like it always has been. But that is the kinds of weapons systems we are talking about in the close combat area, direct fire weapons primarily.

Senator GOLDWATER. You talk about this echelon attack. Isn't that basically what we are going to do, too?

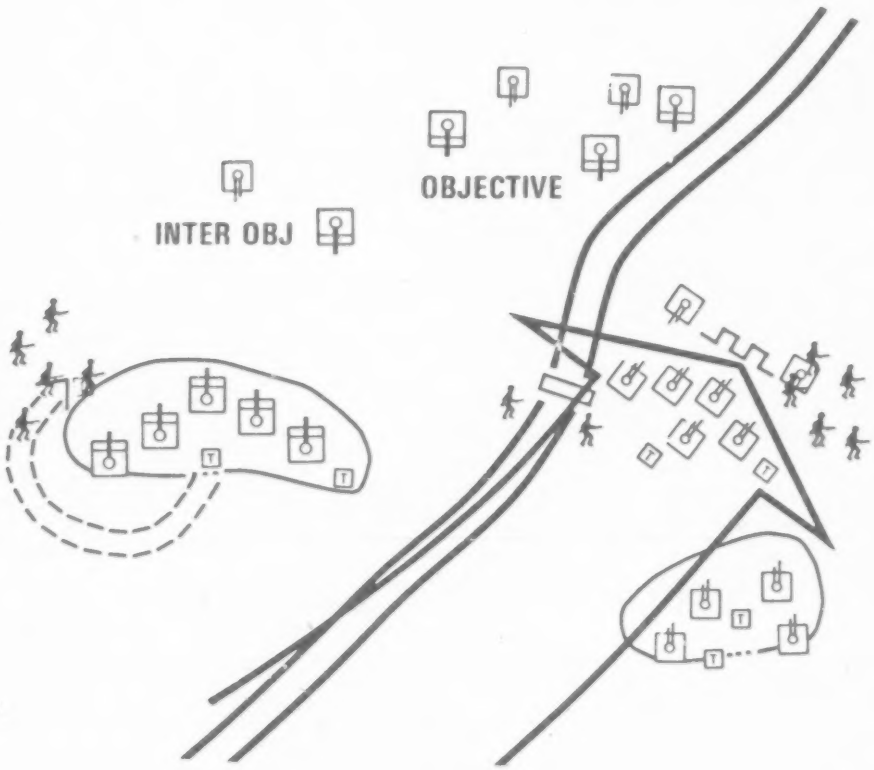
General MENETREY. If we can. Sir, as you know, you open up and you either envelop or you punch through. Once you do that and set the stage for it, you exploit. Essentially that is true.

We do it slightly differently. They do it in a much more regular way. They line up, you know, just like you would get in a queue. We hope we are a little more sophisticated, have a little better command and control and maybe have a little more initiative so that we can take advantage of our opportunity better. But that is essentially the difference.

Again, those same kinds of forces that are engaged in that close combat, that direct fire kind of force would take advantage of those windows of opportunity I mentioned and counterattack after you

blunt that second echelon giving you that opportunity to regain the initiative. Those are the same kinds of forces we are going to talk about, the tanks, the infantry fighting vehicles, the attack helicopters, and those things that are right there at the leading edge.

ATTACK INITIATED



INFANTRY ARMOUR TEAM

I will get right down to where the action is. Here is an infantry armor team, a company, if you will, a company team. Here are some tanks, M-1 tanks, here are some M-2's, or infantry fighting vehicles, and they are going for an objective, they are attacking it.

The infantry has a role, of course. They are establishing a strong point here to protect the tanks on the flank. Here they are breaking a little minefield perhaps. You have to dismount to do that. Here they are reducing a strong point and getting ready for the attack.

As they attack with the M-1 tank being able to shoot on the move, they move rapidly across terrain, and we are able to envelope that target without stopping to shoot. The infantry fighting ve-

hicles can support that attack now. They are doing so in this example. Over here the infantry, instead of having to dismount and move through the woods can, depending on the opposition, move rapidly while mounted and envelope in both directions. The TOW's are supporting as shown.

I know you are familiar with this, but just to show how you have to combine all of this together in the close-in fight in order to be effective and with the systems we are about to get into we can do that better. That is essentially what this shows.

In conclusion, these are the imperatives, as I mentioned, see deep, strike quickly, move fast, attack deep, and finish rapidly. We have to command and control and we have to support in order to do that.

Looking at this close combat area we come up with some deficiencies or shortfalls. Here are our systems as we now have them, some of them, the M-60 tank, the M113 carrier, Cobra, scout helicopter, and the TOW. The shortfalls when we looked at threat in our doctrine, in our concept are shown over here.

Now most of it is self-explanatory. Particularly the Soviets are getting more lethal and, therefore, our survivability is less. Continuous combat. We are better able to fight at night and through obscuration. Integrated battlefield: Better able to fight on that nuclear and chemical, and particular chemical battlefield. And finally, mobility and lethality.

Sir, that is just to set the introduction, and General Merryman is now going to go through those systems that Dr. Sculley mentioned one by one for your detailed questions.

Senator GOLDWATER. Let me ask you. I take it you do not object to our reviving gas warfare more than we have?

General MENETREY. I am sorry, sir?

Senator GOLDWATER. You do not object to the United States getting back into the gas warfare business more than we have the capability of now?

General MENETREY. Sir, I object to chemical warfare.

Senator GOLDWATER. I think everybody does.

General MENETREY. So I don't want anything to be said which indicates that I advocate it. But I think we need the capability since the Soviets obviously have the capability and are planning to be able to use it if it is to their advantage. So I believe that we need the capability not only to counter that but to deter it. If you have to run around in all of that protective gear and the other guy doesn't, you are in a world of hurt. It is true if you try and get in a foot race with them, and it is the same with any other function of combat.

I believe, sir, that we have to have the ability to protect ourselves and the ability to deter their use of chemical warfare which means you need the ability to fight it if that is the case.

Senator GOLDWATER. One more question. Doctor, in research and development, have you moved at all in the general area of the tilt rotor aircraft that Bell has developed?

Mr. SCULLEY. Yes, sir, we have. I think General Merryman being an aviator could provide some additional details, but, yes. We are very interested in this. In fact, we have an upcoming joint program with the Marine Corps.

Senator GOLDWATER. I was just wondering if there had been any military uses discussed of that aircraft. You don't have to get into it today, but I would sometime when you are further along like to know what the general thinking is about it now that I am promoting it.

Mr. SCULLEY. We will be happy to provide that.

[The information follows:]

As a DOD designated lead service, the Army has recently embarked on a Joint Services Vertical Lift Aircraft Development Program, known as JVX. This newly initiated joint program will result in the development and fielding of an advanced technology aircraft capable of performing Army intelligence gathering, Marine Corps vertical assault, Navy and Air Force combat search and rescue, and Air Force special operations well into the 1990's and beyond. The tilt rotor concept in addition to the advancing blade concept, tilt duct fan and pure helicopter concepts will all be technically assessed to determine the most optimal approach satisfying multimission service requirements. I might note that all services have entered this program with a spirit of enthusiasm and cooperation which we anticipate should yield positive results.

Senator GOLDWATER. I have some good feelings about it. On the other hand, it is a big aircraft and you could probably hit it with a slingshot. It is a fine aircraft.

CLOSE COMBAT

[Dollar amounts in millions]

System	IOC [1]	Fiscal year—		
		1983 RDTE	1983 procurement	
			Quantity	Amount
M–1 Abrams tank	1981	$85.9	776	$2,025.0
Bradley fighting vehicles	1983	50.5	600	1,010.4
Apache attack helicopter	1985	33.7	48	965.0
Scout helicopter	1986	75.8	([2])	45.1
TOW antitank missile	1983	2.0	12,000	145.2
Hellfire antitank missile	1985	19.3	2,971	267.5

[1] Fiscal years. [2] Long lead.

General MERRYMAN. Sir, this slide shows the systems in the close combat mission area, and you will see slides like this with the subsequent mission areas. They will all read the same with the initial operational capability [IOC] date, the R. & D. dollars and the procurement dollars. The numbers you see here you will see again as each system is discussed.

Senator GOLDWATER. Do you think they can produce 776 tanks this year?

General MERRYMAN. Yes, sir. These are 1983 tanks, sir.

Senator GOLDWATER. What is the present rate of production?

General MERRYMAN. They are at 30 a month. In February they produced 26. They are, as I recall, sir, at the end of last month, five behind the PM's estimate.

What we predict, sir, is 60 a month this November. The PM tells me that they will be able to reach that 60 a month.

This turns into 90 a month, sir, as you know, later on in 1985. But it is the PM's estimate at this time that we will hit 60 by November and he will be able to buy those 776 with 1983 dollars.

Senator GOLDWATER. Can you justify two antitank missiles? Would one do just as well?

General MERRYMAN. Well, sir, we need to have light ones and heavy ones. The TOW and the Hellfire are heavy antitank missiles. We also have the Dragon which is a medium-weight missile and are looking into replacing with a thing called the Rattler. Actually we have three, Senator Goldwater.

Senator GOLDWATER. I asked that question because I don't know of a field that we are in in the military where we have as much proliferation and redundancy as in the missile field. We have been having a lot of static lately, again in the newspaper, about the Maverick. My aide, the colonel back here, has actually fired them and he knows they are good.

The Army uses the Maverick, don't they?

General MERRYMAN. No; they don't. Sir, let me add on to what I said. I was giving you a general missile answer, and you are looking at the slide and I think your question is keyed to TOW and Hellfire.

Let me answer it this way. We have had TOW around for a long time. I am going to talk about it a little later. We now have three different versions. TOW has of range limitation, [deleted] whereas the Hellfire, can destroy a target [deleted] away when used in a direct fire mode and up to [deleted] when fired in the indirect mode. So you have a range difference there that is of significance.

The second major difference is the penetration. The Hellfire penetrates significantly more armor thickness than the TOW does.

The third thing you have got is that they are directed, or guided differently. The TOW is directed by wire, from the helicopter or from the missile launchers, and the Hellfire is a laser guided missile.

What this says, Senator Goldwater, is that if the other side figures out a way to exploit the vulnerability of one of the systems, you can get them with the other one.

So I honestly think that what we have done here is a logical progresssion of capability.

Senator GOLDWATER. How do your people feel about the three different TOW approaches? Don't they like the wire-guided best of all?

General MERRYMAN. Yes, sir. All three are wire guided.

Senator GOLDWATER. All three are?

General MERRYMAN. Yes, sir. What you have is a basic TOW which you and I are familiar with and we have had for years. But we learned in 1978 that basic TOW [deleted]. So we went into an analysis as to what we should do. About the same time we learned that the Russians would probably come along with a future tank that would be protected even more than the T-64 or T-72. So we engaged in a twofold effort.

The first effort was to develop a system called Improved TOW which will penetrate the [deleted]. The second part of the effort was to develop the TOW 2 which is a bigger warhead, one-inch larger, and we are confident it and Hellfire together will penetrate anything the Russians show up with in the next decade.

Senator GOLDWATER. I fired that first wire guided TOW. It has been a long time ago, but it is amazing. It is awfully hard to miss with it.

General MERRYMAN. Did you fire it from a Cobra?

Senator GOLDWATER. It was a good 12 years or more ago. I forget the model helicopter we were flying.

General MERRYMAN. It could have been a Cobra or we had a couple of experimental Huey's.

Senator GOLDWATER. It was probably a very early Cobra.

General MERRYMAN. It is phenomenally easy to sit in that front seat and fire the TOW. I have used the same words you have just used, I don't see how you miss, and as a matter of fact they don't very often.

Sir, the day after tomorrow you are having a special hearing on the tank. With your permission, I won't go into any other detail.

Senator GOLDWATER. You don't have to get into it today.

General MERRYMAN. All right.

M2/M3 Bradley fighting vehicle

Fiscal year 1983:	*Millions*
R.D.T. & E. request	$50.5
Weapons system procurement request	1,010.4

Cross country mobility, increased protection, and vehicular mounted firepower.
Complements M-1 tank.
Fiscal year 1983—Fourth year of production.
Total buy 6,882.
1,100 procured through fiscal year 1982 FDP.

The first system then that we will discuss in some detail, sir, is the M-2/M-3 Bradley fighting vehicle. As you know, in any future war our infantry and armor are going to have to fight together to survive. This vehicle gives our infantry forces their true first fighting vehicle system, [FVS]. It enables the infantry to stay up with our tanks. It enables them to fight into the battle and it enables them to be prepared to fight against Russian forces that use both tanks and fighting vehicles in complementary roles. This Soviet capability requires that we have this vehicle along with our tank out there.

Senator GOLDWATER. What is the unit cost of this?

General MERRYMAN. The average unit procurement cost, sir, in 1983 constant dollars is $1,320,450.

Senator GOLDWATER. Well, we have learned that the cost of this fighting vehicle has increased this year as a result of rising overhead costs experienced by the manufacturer. Could you give us a breakdown and justification for these higher charges?

General MERRYMAN. Yes, sir. Now our briefing, sir, is going to include this. Would you like me to do that now? I have charts to brief later during the presentation.

Senator GOLDWATER. You are going to get into that?

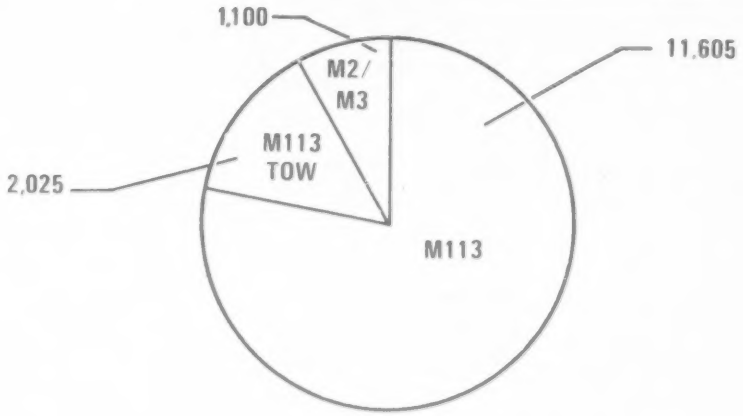
General MERRYMAN. Yes, sir. On each system what I am going to do, Senator Goldwater, with your permission, is tell you what the system is, where we are today as far as having systems that are similar to it, if appropriate, where the Soviets are, and then where we are going to be in 1987. Then I am going to talk about how we

are going to procure the vehicles, give you a financial summary, and talk cost growth.

Senator GOLDWATER. Could you also explain why these increases were not forseen and what would be the impact if Congress refused to fund these increases?

General MERRYMAN. Yes, sir. I will get into that, sir, in about four slides down.

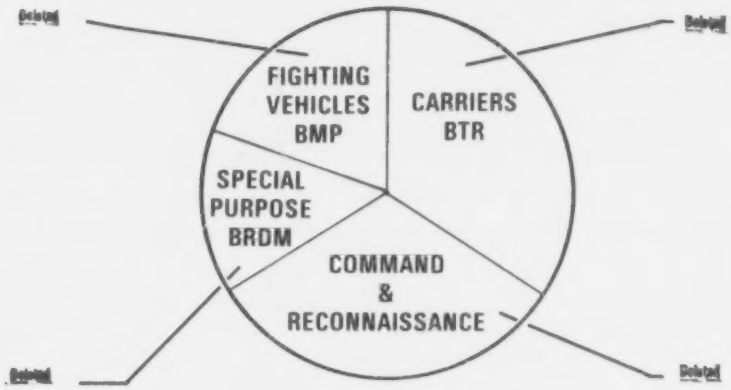
CARRIER ASSETS - END FY 82
FDP



TOTAL ASSETS 14,730

What I am showing you here, Senator Goldwater, are the carrier assets we currently have in the U.S. Army. You will recognize the M113, the M-2/M-3 is the Bradley, and the M113 TOW. The carriers shown are what we would have procured at the end of the fiscal year 1982 funded delivery period.

SOVIET ASSETS



TOTAL ASSETS [redacted]

What this slide shows, sir, is a breakout of what the Soviets have. As you will notice, they have several types. As a matter of fact, there are several types of vehicles within each one of those blocks in this pie chart. You have the BMP to your upper left which is similar to our FVS. You have the carriers to the right, the BTR which is similar to our M113. Then you have command and reconnaissance and special purpose BRDM's in the numbers shown there. As a matter of fact, I have a list here. There must be about 20-some odd varieties.

Senator GOLDWATER. These all come under the classification of either tanks or mobile weapons?

General MERRYMAN. Not tanks. They come under the classification of a fighting vehicle or a carrier. This is equivalent to the chart I showed you before where I showed you our M113's and the Bradleys.

Senator GOLDWATER. I was wondering if these were included in the 50,000 tank total that we were informed of yesterday?

General MERRYMAN. I saw the slides that DIA used, sir. The number, I don't have that particular slide with me.

General MENETREY. It doesn't sound like it. They have about that number of tanks, period.

Senator GOLDWATER. Is that 50,000?

General MENETREY. Yes, sir.

Senator LEVIN. If I can interrupt while the chairman is reading the chart. I am wondering if you are going to be making qualitative comparisons, too? Is that part of your presentation?

General MERRYMAN. It wasn't, sir, but I think we are prepared. I have the PM here.

Senator LEVIN. Well, maybe a word or two. I don't want to lengthen your presentation, but if you have the information ready and you can make a quick qualitative comparison, it may be useful.

General MERRYMAN. The FVS is superior to the vehicles that I am showing you here. The BMP, as a matter fact you know, was brought into the Soviet inventory some years ago. They are developing a follow-on as they are, you know, for everything else. But to my knowledge, and I will have the PM correct me if I am wrong, our FVS is superior to anything that they currently have in any of those blocks.

[Additional information follows:]

QUALITATIVE CARRIER COMPARISONS

Senator LEVIN. Provide qualitative comparisons of Soviet armored fighting vehicles.

General MERRYMAN. Warsaw Pact infantry vehicles are normally grouped into four categories: fighting vehicles, command and reconnaissance vehicles, personnel carriers, and special purpose vehicles.

The fighting vehicle group includes the BMD (8 percent) and three versions of the BMP (92 percent). Until the IFV, the BMP was unquestionably the finest infantry fighting vehicle in the world. It is built in at least nine variant forms, mounts a 73mm smooth bore cannon with a coaxial 7.62 mm machinegun and AT-3 SAGGER antitank guided missile, has nine firing ports, and a two-man turret. It carries a crew of three and eight infantrymen, weighs 15 tons, and can travel 300 miles at speeds up to 36 miles an hour. It has an NBC overpressure system, combined steel and aluminum armor, and is amphibious. The BMD is lighter, slower, carries only six personnel, but is one of the best airdroppable fighting vehicles in existance. It has the same armament as the BMP.

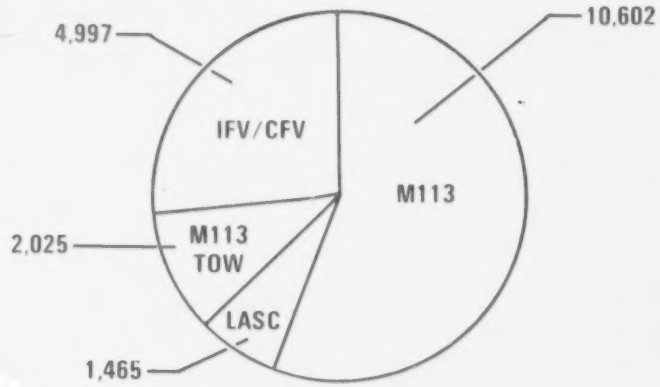
The armored personnel carrier group is composed of the MT-LB (10 percent) and the BTR family (five variants composing 90 percent of this group). The BTR comes in both wheeled and tracked versions with at least a 12.7mm machinegun weapons station. Nominal BTR capabilities include a 12-man capacity, rolled steel armor, and a 50 miles per hour speed for the wheeled version. Variants range in speed (28–39 miles per hour), range (150–485 miles), and capacity (8–20 troops).

The command and reconnaissance group includes variants of the BMP, BTR, BRDM, ACRV, and PT76. The BRDM family comprises roughly 40 percent of the total. It will carry 2–6 troops, is very light and fast, mounts one heavy and one light machinegun, and can travel up to 470 miles without refueling. It is a wheeled vehicle and an excellent swimmer.

The special purpose vehicle group includes variants of the BRDM (95 percent) and the MT-LB (5 percent). The primary special purpose is launching antitank guided missiles, but other special purposes include command and control, maintenance support, chemical support, multiple rocket launchers, surface-to-air missiles, mine clearing and target acquisition. The MT-LB family is derived from an arctic research vehicle. It is a large, wide tracked vehicle that provides a stable platform for heavy duty roles. It has a turret mounted 7.62mm machinegun and firing ports for the passengers. BRDM's configured to fire antitank guided missiles do not have close-in protection, but may carry up to 15 AT-5 missiles.

With a few exceptions, Warsaw Pact vehicles are amphibious, possess infrared viewing capability, incorporate more extensive NBC protection than U.S. vehicles, and are produced in multiple variant forms. Also, they are generally less reliable, less mobile, and less considerate of human engineering factors than U.S. vehicles.

CARRIER ASSETS - END FY 87
FDP



TOTAL ASSETS 19,089

Now what this shows you, sir, is where we will be in 1987. What I am trying to do today, Senator Goldwater, is to take a first step in what I promised you earlier today and let you know as much as we know today, being as open as we possibly can. This is the Army's plan now based on what we see as projected total obligational authority [TOA] out through 1987. If that changes, I will have to show you different numbers of course in the next year because there is no way we can get to this point unless things stay as we now know them as a result of Defense Department guidance and what they have told us we can plan on for the next several years.

Senator GOLDWATER. Well, that totals about 18,000.

General MERRYMAN. Yes, sir.

Senator GOLDWATER. What was their total?

General MERRYMAN. It is way up there. [Deleted] they are still producing and, as I just showed you, we will have 19,000 in 1987. This gets back to what we talked about earlier. There isn't a way we can catch them, as you know, with the funding constraints we are going to have to live with, but we can catch them qualitatively, I think, with the FVS.

Senator GOLDWATER. As I told an admiral yesterday, in discussing this argument about quality versus quantity, I am reminded of the fact that back in the 1870's we had one-half of the U.S. Army in the territory of Arizona. They were fighting 200 Indians, and the Indians kicked the hell out of them. so I don't buy that business about quality too much.

M2/M3 FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement of 600 vehicles, 532 guns, 25mm, 2.5M rounds ammunition, 25mm, and spares.

Fielding of M2/M3 in CONUS and Europe.
Development—TOW 2 and NBC modifications.

General MERRYMAN. Now this chart shows, sir, and you will see this on all of the systems, what the 1983 dollars will buy, and it is pretty clear.

Senator GOLDWATER. Is the 25 millimeter a good ground weapon?

General MERRYMAN. Oh, yes, sir, that is the Bushmaster weapon.

Senator GOLDWATER. Can that 25 millimeter destroy a tank like a 30 millimeter?

General MERRYMAN. Not a tank, sir. Well, if it hits it in the right place, the answer is yes. If you luck out and are able to hit the engine or something like that you can destroy a tank. The main thing is that it can destroy a BMP.

Senator GOLDWATER. Is it armor piercing?

General WHALEN. Yes, sir. That is correct. It has both armor piercing and high explosive ammunition.

General MERRYMAN. Sir, I did the operational test of that vehicle while I commanded Fort Carson and had an opportunity to fire it. It will immobilize any vehicle. That is, it will tear off the suspension and track system and so on, but it will not penetrate the interior compartment of the heavier tanks.

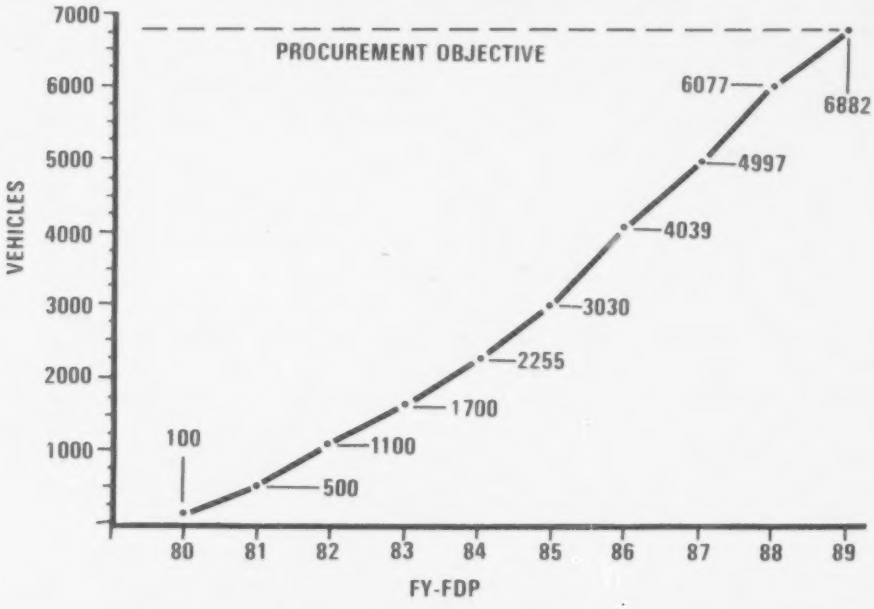
Senator GOLDWATER. Do you use the 30 millimeter at all on ground weapons?

General MERRYMAN. You use it on the AAH. Are you talking about the Hughes chain gun?

Senator GOLDWATER. That is the one they fired from the A-10. That round can penetrate.

General MERRYMAN. No, sir, we do not.

M2/M3 PROCUREMENT OBJECTIVE



What this chart now shows you, sir, is how we this year plan to buy out the procurement objective. In other words, the procurement objective being the number of vehicles we see buying, the M2/M3, and the number by year that we hope to procure.

Senator GOLDWATER. Will the Soviets buy more of this equipment in the next 5 years than we will?

General MERRYMAN. Oh, yes, sir. They will buy more in the next 5 years than we buy in the next 10, even if we buy the numbers I am showing here, and probably in fewer years than that.

Sir, at this time, with your permission, I would like for the project manager to give you an update on the second source, which I know you are interested in, the testing status which we are putting the vehicles through and the financial status of Bradley.

General WHALEN. Sir, following from General Merryman's remarks, as he said, we end up with buys in 1982 of 600 vehicles. We are asking for 600. We continue on to our initial objective of acquiring 6,903 of these altogether at a total cost of $12.8 billion in procurement and $560 million of R. & D.

Senator GOLDWATER. Have you done the same thing with this as you have done with the main battle tank, to indicate to the manufacturer that that is what you are going to buy?

General WHALEN. Yes, sir, he knows those figures.

Senator GOLDWATER. It is not a contract, is it?

General WHALEN. It is not, sir. Each year it is funded on its own.

Senator GOLDWATER. You go at it year by year?

General WHALEN. Yes, sir. We will be going into the multiyear as we break up the components. We may get the multiyear with

the principal contractor, FMC, but our first multiyear contracts will be as we break up major subsystems.

Senator GOLDWATER. Wouldn't it be advantageous to contract for the whole bundle?

General MERRYMAN. Yes, sir.

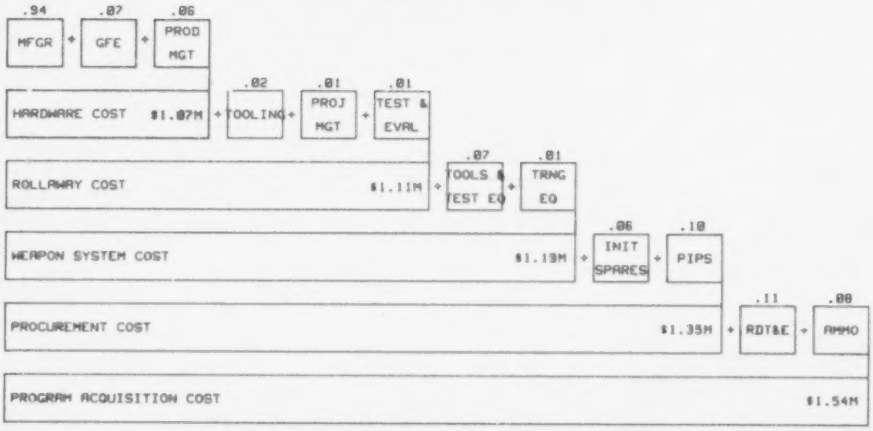
General WHALEN. It varies how much that benefit is as you go from industry to industry and contractor to contractor. The general answer is yes, Senator.

General MERRYMAN. What you are getting at there, Senator Goldwater, is something that we feel strongly about, too: Multiyear contracting. Later I will give you some examples of how we can save money with multiyear contracting for selected programs.

General WHALEN. And we do have specific plans for multiyear also in this system.

COMPONENTS OF PROGRAM COST

(AVG UNIT FY83 C$ $MILLION)



Sir, I would like to talk about the cost of a vehicle in building-block terms. There has been a lot of talk in the media of how much a vehicle costs and I think all of the talk has been accurate in one way or another, but we suffer from too many cost terms. We talk about various different kinds and we talk about them in different year dollars.

This is this year. It is fiscal year 1983 dollars and it is how much we believe this vehicle will cost averaged out over that whole buy of 6,882 vehicles.

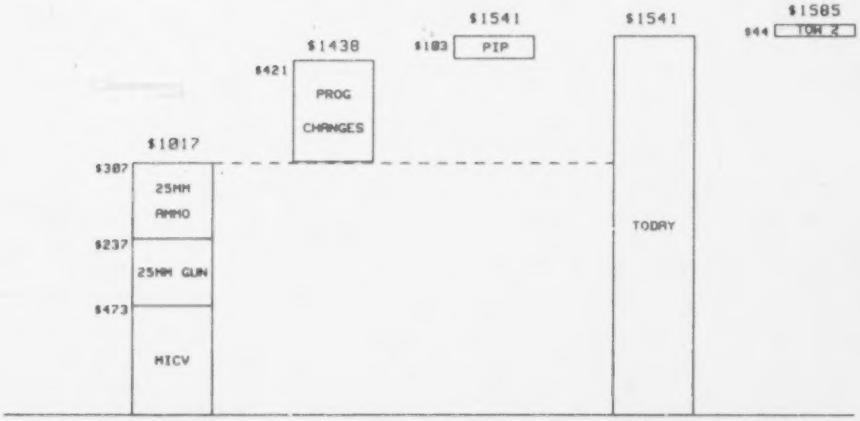
The building blocks that I have here are that the hardware alone costs $1.07 million. If I add to that tooling, project management, both at the contractors and the Government, and the necessary test and evaluation, we have what we have been judged against since our production decision, our DSARC, the roll-away cost, how much does it take to roll away out of the plant and head for the field. That is $1.11 million. I add more on there for tools and test equipment and training that is necessary. That comes to a weapons

system cost. If I add the necessary initial spares and what we are carrying as deliberate product improvements of the vehicle I get to an overall figure of $1.35 million. I then amortize the R. & D. and ammunition. We are unusual in that our ammunition is reported against the cost of the vehicle.

For instance, in the case of the tank that is not so. But in our case our 25 ammo shows up. That comes out to the total cost that is the program acquisition cost expressed in fiscal year 1983 dollars of $1.54 million. From hardware of $1.07 to program acquisition of $1.54.

PROGRAM UNIT COST WITH TOW 2

(FY 83 C$ THOUSANDS)



Senator GOLDWATER. Pardon me. What engine does that use?

General WHALEN. It is a Cummins diesel 500 horsepower commerical with very minor modifications, sir.

Again in fiscal year 1983 constant dollars our baseline as in the case of the tank goes all the way back to 1972 when SAR's first were born. We have a little different situation from the tank again in that the M-1 today is essentially the same vehicle it was in 1972. We are not. In 1976 there was a major program change that increased the capability of our vehicle. So our base date is really November 1976. To back down into the 1972 dollars there are some artificialities. But essentially this is correct.

This is the old 1972 MICV that would have cost $473,000. Putting in that 25 gun with all the integration and the precision stabilization system that we have now increases another $237,000, and then putting in the ammunition increases to the $1.1 that I talked about before.

Program changes that have occurred since then have added another $421,000 to that vehicle. I have a detailed breakdown of that that I can go through if you choose. Our planned product improve-

ments, another $103,000. So that today we are in program acquisition costs at the $1.5 million, and that is how we got there.

Looking to the future, we do plan to incorporate TOW 2 into the system. That means changing our fire control to optimize the ability to fire the new TOW 2 missile. General Keith testified on this last year in terms of development, but this year I have the first cut at a procurement cost. These will show up for the first time in the 1985 dollars. We plan to cut this into production in fiscal year 1985 and it will be an increase in unit cost of about $44,000 per vehicle. We then also have to go back and retrofit the vehicles built before that.

The second source. Sir, it is this committee that showed the most interest in 1980 on getting a handle on cost in terms of second sourcing the assembly of the vehicle.

I would like to tell you where we are on this. We have a decision that must be made, and really there is only a two-way decision that can be made, either do not proceed with the second source or do proceed. If the decision is to proceed with a second source, you can do it either justified by an economic consideration or from a mobilization based consideration or a combination of the two.

Our schedule to come back to you is to take the proposals that we have now received from our three contractors as of this week, analyze them, determine an Army proposed decision on whether or not to go second source, and get concurrence from the Office of the Secretary of Defense by June 1 because we owe you a report by June 30.

If the decision is favorable, we will have to come in in order to execute the program that we have laid out with a request for an additional $73 million and five vehicles in fiscal year 1983, and we will have to change the 1984 to add approximately another 230 vehicles. We show it as 229. And we will have to restore our ramp to 90 vehicles per month where we want to get overall into the 1985 timeframe. As it stands now it doesn't happen until 1986. So there is an impact on that and we will be reporting to you this summer with our recommendations.

Sir, briefly I would like to talk about how we are doing with our initial production vehicles. Last year we were threatening to go into production but we had not. We had a congressional mandate to roll the first production vehicle out in May 1981. Despite a 3-month strike at FMC that started in April, that mandate was met. The first vehicle came out May 8, 1981. The second vehicle didn't come out until August, but we did neet the mandate. As of the end of February we are up to the point where we have 20 production vehicles and we expect to get 10 more this month. This is the first month then of double-digit production.

We have taken the first production vehicles and run them down to Camp Roberts and run them through some stringent production testing down there. We came out of our development with a requirement to meet 195 mean miles between failures. That was our stated requirement and we actually demonstrated 289.

After all the changes for producibility to decrease the cost in production we had to start down again. We anticipated that we would achieve a steady state in production this year, next year and the year after that of about 240 mean miles between failure. That, too,

is our requirement. Thus far we have demonstrated 313 during that testing.

RELIABILITY RESULTS
(MMBF - MEAN MILES BETWEEN FAILURES)

	REQUIREMENT	CONTRACTOR TEST EXPERIENCE
MOBILITY	(620)	877
FIREPOWER	(480)	527
SUPPORT	(2200)	6266
	240	313*

* MMBF = 306 WHEN MAIN GUN SYSTEM IS NORMALIZED AT 2 RDS PER MILE PER MISSION PROFILE

RESULTS OF DATA THRU 16 FEB 82
VEHICLE MILES 17544
25MM ROUNDS 33113

Just a brief bit of detail on that. This is the status down at Roberts. We have gone through almost 18,000 miles. We fired over 33,000 rounds. As you can see in the case of mobility we are required to meet 620. We have met the 877, firepower, 480 versus 527 and so forth. This gets to the 240 versus 313 and that is normalized down to 306. We are very, very pleased with the results of our testing to date.

FIELDING

To TRADOC: May 1982.
To FORSCOM: March 1983.
To USAREUR: 7th ATC, March 1983; 1st BN hand-off, September 1983; and POMCUS, February 1984.

Finally, sir, our schedule. Later this year in May 1982, we will go into the training base at all four of the posts that are associated with our vehicle.

Our first unit will be at Fort Hood in March 1983. We will go to USAREUR into the 7th Army training center, also in March 1983. We will hand off into the 3d Division similar to the M-1 in September 1983 and we will put our first equipment into the POMCUS in February 1984.

Sir, this completes my presentation, if there are any questions.

Senator LEVIN. Are you going to give us information about the M-113?

General WHALEN. Sir, I can, or I can at least try to.

Senator LEVIN. Are we going to buy more of these vehicles?

General WHALEN. Yes, sir, the Army does plan to buy more. I don't know how many. I am the PM just for the M2/M3.

General MERRYMAN. A little over 500, Senator.

Senator LEVIN. Is this a fighting vehicle variant of the M-113 that we are buying?

General MERRYMAN. No, sir.

Senator LEVIN. Have we compared the fighting vehicle variant of the M-113 in cost and effectiveness to the Bradley vehicle, the cost effectiveness of the two vehicles?

General WHALEN. Sir, we have not done that in a formalized sense, in the full-blown study sense. We have looked at it and we in the office certainly have looked at the costs in particular. The fighting vehicle version is the AIFV that was sold to the Dutch and the Belgians. The cost is in the ball park, and I don't remember the exact amount, of about 50 or 60 percent as much I believe. The capability is considerably less.

Senator LEVIN. So you could get two of the M-113's for one of the Bradleys?

General WHALEN. Two of the AIFV's. Not two, sir. A little bit less than two, but in that ball park.

Senator LEVIN. Would you rather have two of the variants—the AIFV?

General WHALEN. Yes, sir; Armored Infantry Fighting Vehicle.

Senator LEVIN. Would you rather have two AIFV's or one Bradley?

General WHALEN. As the PM, sir, I would rather have one Bradley. I am going to have to defer to——

Senator LEVIN. You are not that objective on the subject.

General WHALEN. That is right, sir.

Senator LEVIN. Who shall we ask for an objective answer to that question?

General MERRYMAN. We have got a combination that can answer you, sir. This is a requirements man from the Army.

Senator LEVIN. Well, why don't we hear from all of you. Would you rather have two of the AIFV's or one of the Bradleys?

General MENETREY. Sir, if I had that choice, and it would depend on where I was of course, I am not too sure there is an equality between that equation you just mentioned, two for one. As I understand the Dutch variant, or the AIFV, it does not have the night capability and it does not have the stability. The suspension is such that you do not have the speed over rough surfaces. So it is a very difficult question to answer. You know, they are not equal vehicles. Therefore, two for one is a difficult kind of equation.

General WHALEN. Sir, if I may add on to that, objective or not, it was in November of 1976 also that the Army really restructured this program based on detailed analysis that showed you had to proliferate the TOW missile system on the modern field of battle to win, and the AIFV does not have that.

The TOW would have to be proliferated in some manner if it wasn't on this vehicle.

General MERRYMAN. Let me add a final note to that, Senator, if I might. Even if you bought two for one, sir, and if the Army were to stay at the same strength it is you would have a problem as far as force structure is concerned.

Many times it looks very attractive to us, to buy something that is less capable and buy two or three of them rather than a more

expensive, advanced system. However, it turns out that the people problem is the driving factor as to why you really shouldn't do that.

Senator LEVIN. We don't have enough people?

General MERRYMAN. We don't have enough people in the Army, sir.

Senator LEVIN. Is that also the reason why we are so far behind in tanks and personnel carriers because we don't have the people to drive them?

General MERRYMAN. No. What I am saying, sir, is that if you want to develop a balanced Army you need lots of things. So you can plan to use only so many of those spaces in the Army for this particular vehicle.

If you bought twice as many of this thing, you know, you would have to give up something else. I am just pointing out that people considerations are very important.

Senator LEVIN. What I am saying is that when you point out that we are way behind, you are saying that even if we could procure twice as many of these vehicles, if we had the money to catch up with the Soviets, that we might not be able to do it from a personnel point of view.

General MERRYMAN. If you are talking about buying the same end number but going out and buying it faster, I understand.

Senator LEVIN. No, no. I am talking about doubling the end number and buying them faster.

General MERRYMAN. OK. Then the point I am making is that if you did and the force structure stays constant, then something else has to go.

Senator LEVIN. So we might not have the personnel to buy twice as many of these vehicles.

General MERRYMAN. That is right, sir. In other words, you might have to end up giving up trucks or tanks or whatever.

General MENETREY. You are not likely to have more mechanized infantry units or battalions and so on.

Senator LEVIN. The antitank missile is the defensive weapon against these carriers, right?

General MENETREY. It can be.

Senator LEVIN. What is the relative status in terms of the numbers of antitank missiles that we have compared to the Soviets? Are we better off in that category or are they better off?

General MENETREY. Sir, they are better off. I will have to get you the number.

Senator LEVIN. On defensive weaponry against tanks?

General MENETREY. You said antitank guided missiles, I believe, sir.

Senator LEVIN. What other defensive weaponry is there besides the guided missiles?

General MENETREY. Well, the tank cannon.

Senator LEVIN. Other than the tank cannon. It would be just the guided missile?

General MENETREY. You have airborne systems and ground systems and so on. But the traditional antitank guided missile, such as our TOW, they have greater numbers, sir. I will have to get you the exact numbers.

[The information follows:]

The current worldwide inventory of ground antitank guided missile (ATGM) launchers for the Warsaw Pact is approximately [deleted] compared to [deleted] for NATO. U.S.S.R. forces contribute approximately [deleted] ATGM to this total versus [deleted] for the US.

Senator GOLDWATER. General, I asked you some questions about the fighting vehicle and you said they would be touched on but they haven't been. We wanted a detailed breakdown and justification for higher overhead, why were these increases not foreseen and what would be the impact if we refused to fund these increases?

General WHALEN. Sir, if I could try that. I would like to start, if I may, on a distinction that our Under Secretary makes, Mr. Abrose, between short term and long term. He calls the short term the green dollars years, when you have to sign a contract and hand out green dollars. Then beyond that we get into the realm of the cost analysts and the projections of how much is this going to cost in the future. In that latter area we have the Carlucci initiative, that says budget to the most likely cost.

In the short term the ones that we can really strictly control, we realized 2 years ago that we had a problem with the 1980 contract. That was discussed in the testimony 2 years ago and the number of vehicles was cut at 100 that would be produced. Sir, we are going to produce 100 vehicles just as we said.

We came in and asked for an amount of money to produce 400 vehicles in 1981 and we are going to produce 400. Last week we shook hands on a contract with the contractor for the 1982 buy for 600 vehicles with the amount of money that we came in and requested.

So in the green year dollars the places that we can really control costs, I am here to say, sir, we are controlling them. We told you what we would buy and we are going to buy 1,100 vehicles for those dollars.

Now I have got to go into the cost analysis area. I did analyze the trends that were developing in these 1980, 1981, and 1982 contracts and projected outward what I thought the outyear costs of this would be. I may have been too conservative in doing that. I don't know. But they are my honest, best judgments on outyear costs. Those do show cost increases.

One of the areas of cost increase is overhead. Overhead for a contractor really falls into two areas, controllable and uncontrollable. Part of the uncontrollable one is his business base. He can project how much business he is going to have and he will split his overhead in his forward pricing based on that. If that business base does not materialize, your overhead is going to go up and that is not really controllable.

We have a little bit of a situation like that at FMC projected into the outyears now, some optimism there on their foreign sales of M-113's. I don't know how those will turn out. They have gotten a Marine contract, that should help that overhead problem.

THE CONTROLLABLE OVERHEAD

I have been concerned about FMC's controllable overhead to the extent that I went directly to the president of the company, Mr. Tower, and talked with him on this and emphasized the necessity for overhead control in the outyears.

Senator GOLDWATER. What would be the impact on the Army if we didn't fund the program?

General MERRYMAN. The posture that would leave us in, Senator, is that our tanks then would not be supported by a fighting vehicle such as the Soviets have today. In other words, if a war started with Russia today you would have the Soviet tank and the Soviet BMP working together as a team.

Senator GOLDWATER. I am not talking about canceling. I am asking what the impact would be if we didn't want to fund the increases?

General WHALEN. Sir, the short-term impact, as I mentioned, would be none for 1981 and 1982. In 1983 it would eventually get down, as it always does, to the procurement contracting officer, the PM, the negotiators and the should-cost team that works to turn it into a green year dollar contract. It would be how well we did our job to do the detailed negotiations for a contract as to how many vehicles we could bring in. I would say today presumably we would buy less vehicles.

But if we are hard nosed enough and have our facts behind us, maybe we can bring it into the number that we say we can buy.

Senator GOLDWATER. Is there any way we could get a breakdown on these costs for the record?

[The information follows:]

BFV CONTRACT COSTS

Senator GOLDWATER. Would you give us a detailed breakdown and justification for these higher overhead charges?

General WHALEN. Let me provide that answer in two parts. The first is the projection for fiscal year 1983 and beyond. The outyears are speculative and budgets reflect past experiences projected forward. In the process of awarding contracts, however, we will review overhead with a "hard-eye." Each contractor will be audited and no settlement will be made without overhead being a central focus of negotiations.

The second part is the program experience to date and I can provide some details of the increases there. You may have noted that a long time was spent negotiating the fiscal year 1981 contract. This was mainly due to the increase in overhead which we noted after comparing the proposals from the initial production contract to the second (and later the third year) contracts. The overhead increased approximately 10 percent from fiscal year 1980 to fiscal year 1981 and from fiscal year 1981 to fiscal year 1982. This increase was attributable to a number of factors, the establishment of the Aiken, South Carolina, Parts Plant accounted for almost two-thirds of the increase while the remainder was due to adding an automated manufacturing cost control system, a decrease in the business base and an increase in the overhead rate resulting from a favorable decrease in the number of manufacturing hours. In the case of the Aiken, South Carolina, Parts Plant and the automated manufacturing cost control system, the government conducted a detailed review of the data. The Commanding General, Tank Automotive Command (TACOM), and I requested FMC's top management to brief us in detail on the Aiken Parts Plant. They did this on two occasions and we agreed to an equitable cost.

In the case of the automated system the government sent a team to FMC to carefully review the cost. Again, we determined what was an equitable cost. In addition, FMC has been required to provide a continuous cost-benefit analysis for reivew by government officials.

Senator GOLDWATER. Why were these increases not foreseen?

General WHALEN. As I stated above, the costs were foreseen approximately one year ago and have been projected in our request for fiscal year 1983 and beyond.

In fiscal year 1980 the Aiken Parts Plant and the automation were not foreseen by FMC and therefore not projected by the government in our previous requests. We have scrubbed the requirements and found them to be reasonable. FMC's top management have noticed the increases as not being laudable and have taken steps to control overhead costs. We are continuing to pursue overhead control with FMC management.

Senator GOLDWATER. What would be the impact if we didn't fund the increase.

General WHALEN. The impact I believe, would be a cut in the quantity of vehicles we could procure. The Army has taken into account the limited production experience to date and the results of our negotiated contracts. The budget provides an executable program for the vehicle quantities planned.

Senator GOLDWATER. That is what we are trying to get at. How can the two of us get these excessive costs down. I am very anxious to learn the opinion of the different PM's as to whether the manufacturer is taking advantage of the national desire for increased defense and the willingness of the President to ask for more money, and whether in some cases the manufacturer is figuring that he might as well get a piece of this gravy. I am not saying that happens, but I think it happens here and there. We just want to know where you think we are getting a raw deal.

General WHALEN. Yes, sir.

Senator LEVIN. Could I just ask a question there, Mr. Chairman. Are we obtaining the vehicles on a cost-plus basis?

General WHALEN. No, sir. A fixed price incentive, sir.

General MERRYMAN. If there are no other questions on this system, sir, the next slide.

AH-64 Apache

Fiscal year 1983:	*Millions*
R.D.T. & E. request	$33.7
Weapons system procurement request	965.0

Army's most mobile day/night tank killer.
Fiscal year 1983—2nd year of production.
Total buy—446.
11 procured in fiscal year 1982.

This system of course is the AH-64, Senator Goldwater.

To start with, as you know, we badly need this system. This system provides the Army with a capability that no other system provides. If you visualize a war in Europe tomorrow, this system provides the capability to rapidly move a considerable tank killing capability anywhere on the battlefield day or night rapidly and could very well mean the difference between victory and defeat.

If you visualize war somewhere other than on the European Continent, such as the Middle East, where stringent environmental conditions exist, we would undoubtedly have to fight Russian armor. If that war were fought today, and if the environmental conditions are as demanding as we expect we would have to fight them early in the battle with infantry on the ground, and with TOW's carried by Huey helicopters.

This vehicle is the only system that we have coming off the production line that will provide us the capability of a highly mobile killer that could operate under those stringent environmental conditions in the Middle East.

Sir, since you recently had a special hearing on this system, I won't say anything else about the particular slide and, with your permission, I will go into where we are in the program.

INFRARED SIGHT

Senator GOLDWATER. I have one question. I have to admit I am probably wrong in suggesting this, but on the other hand, I think the Army has to have this helicopter.

Now as I understand it, about 50 percent of the cost is in that infrared sight.

General MERRYMAN. I don't think that number is right, sir.

Senator GOLDWATER. Well, it is pretty close to it.

General BROWNE. The sight, sir, including the integration into the system, is about a million dollars in the total effort. So it is not anywhere near half of the cost.

Senator GOLDWATER. You mean on the sight itself.

General BROWNE. Right.

Senator GOLDWATER. I am talking about the wiring, the installation. I have seen that several times and it is a wonderful sight when it works. I am not sure that it is going to work every time.

My question is would you rather have a helicopter with no sight or not have a helicopter at all?

General MERRYMAN. Sir, if you took off the target acquisition and designation system, and the pilot's night vision system, you really destroy the main reason we need the helicopter.

Those particular systems provide the helicopter with the capability to fly, as you know, in total darkness and to attack targets from standoff ranges day, night, and in adverse weather. That in itself pays unbelievable dividends as we have recently found in an operational test which compared it with the Cobra.

It also takes out your television capability and your direct view optics. If we were to do this, it would beg the question of why we would even buy the bird. The great capability that the AH-64 offers, you see, strongly depends on that sight. You have your laser designator in the sight. So if you still had Hellfire's on the helicopter they would have to be designated from somewhere else. Therefore, the pilot wouldn't be able to see where he is shooting, wouldn't be able to designate a target and he wouldn't be able to fly at night. It would emasculate the program, Senator.

Senator GOLDWATER. Well, the way I see it, you run about 50 percent in your weather across a probable battlefield, about 50 percent of the time you have instrument flight rule conditions during the year round and then I thought you had nighttime. Now assuming that we have the ability to locate the enemy tanks, are we always going to have the ability to travel 50, 60 or 90 miles and with that sight alone be able to locate the tanks? I am very strong on that sight, but I am not strong on the absolute need for it.

General MERRYMAN. You see without that sight, Senator Goldwater, you are back to the pilot's eyeball which is essentially worthless considering the fact that the other side has missiles that can hit you at 3 to 5 thousand meters and tank guns that can destroy you at 2,000 meters.

With that sight you can detect way out there what you are trying to find at long range and that is another reason why we need it. You can do that day or night.

Senator GOLDWATER. Traveling at your nap of the Earth tactics how far ahead can you see with that sight?

General BROWNE. I think we are mixing a little bit of two things here. The pilot's night vision system which the pilot uses to fly the airplane at nap of the Earth at night is totally independent from the sight which the copilot gunner uses to find the targets.

Now the pilot's night vision is a one-to-one magnification with the real world. So the pilot sees with that about 1,500 meters in front of himself in fairly good resolution and sees beyond that with horizon and tree lines and ground terrain formations.

The copilot/gunner, however, with his sight, which has magnification associated with it, can see as far as [deleted] find hot spots with his FLIR, zoom in on them with a narrow field of view and detect and recognize what that is.

Senator GOLDWATER. You can't see [deleted] from the nap of the Earth maneuver.

General BROWNE. From the nap of the Earth maneuver when we pop up, Senator Goldwater, as we flew you in the system, when you pop up just above the trees you search the area and you find your targets and you can detect targets out to five to [deleted].

Now in the daytime you can zoom in with that sight with a TV that gives you 64 power magnification and pinpoint right in there and find out what that guy is. The FLIR which is the nighttime device does not have as great a magnification but it has substantial magnification and you can do that to 4 kilometers at night and recognize a tank for being a tank.

We have some film footage that, if you recall, we showed you, where we compared this sight with the Cobra/Tow sight at the ranges we were talking about. We showed you a little block that showed this is what you would see with the Cobra sight and you saw nothing but a fuzzy bunch of terrain, and when we showed you the zoom in with the Apache sight and you could identify, not just recognize, but you could identify the T-62 tank from the M-43 and from the M-113 we had out there in the target array.

It is a tremendous, powerful asset in detecting, recognizing and making sure you are shooting the bad guy instead of the good guy with this system.

Senator GOLDWATER. Well, I am merely looking at a place where we might save a little money.

What is the price of the Blackhawk now? What does that run delivered?

General MERRYMAN. The average unit procurement cost is $5.71 million.

Senator GOLDWATER. Five million.

General MERRYMAN. Nearly $6 million in fiscal year 1983 dollars.

Senator GOLDWATER. Well, that is a much larger helicopter. I know how good this is and I know how you would like to have the infrared night sight. But, gentleman, we have got to get the price of this down, $6 million for a helicopter. That is what we pay for some small transport aircraft that we buy. I know Hughes helicopers have never been overly priced and I know they have lost

money on them. But I sure hope you can think about that good and hard. The pilot sight, no argument, but that detailed little rascal down there. I remember coming back from a mission and I asked the PM "Who takes care of it?" Jokingly he said, "Oh, we have got some Ph. D.'s." I said, "Yes, the Army is loaded down with them, particularly the enlisted ranks, and I think it is going to take a whole bunch of Ph. D's to keep that helicopter running. I am not going to push on it right now, but I wish you would think about this.

Do you think you are making any progress with Hughes in getting the price down?

General BROWNE. Yes; we are, sir, and I will talk to that when General Merryman finishes.

General MERRYMAN. With your permission, sir, I have a couple more things to show you, and then I am going to call on General Browne to bring you up to date on where we are regarding price and contract negotiations. The Under Secretary, as a matter of fact, spent Saturday, Sunday, and Monday with the PM in St. Louis working with Hughes. So he can tell you exactly where we are.

Senator GOLDWATER. I think a lot of this problem developed when Howard Hughes put everything in and he didn't care whether he lost his shirt or not. Then they found out that Hughes helicopters did not make money. I can understand that because quality for quality you can buy them cheaper than you can other types.

Well, go ahead.

General MERRYMAN. What I will do, Senator Goldwater, is provide for the record all of the specifics as to what that sight does and what has been actually demonstrated.

[The information follows:]

General MERRYMAN. The specific capabilities of the Target Acquisition Designation Sight/Pilot Night Vision System (TADS/PNVS) are as follows:

a. Day TV (DTV). Provides target detection and recognition during daylight conditions. Provides some improved capbility to penetrate haze, smoke, etc. Has two fields-of-view and a zoom capability with magnification of: NFOV [1] (zoom), 122×; NFOV, 61×; and WFOV,[2] 13.7×.

b. Direct View Optics (DVO). Provides target detection and recognition during daylight conditions. By providing color and contrast, which only the human eye can fully utilize, this sensor is most important in initial target acquisition. Has two fields-of-view with magnification of: NFOV, 17.8×; WFOV, 3.5×.

c. TADS Forward Looking Infrared (FLIR). Provides target detection and recognition by the thermal signature of objects and navigation at night and in adverse weather. Totally *independent* of visible light. This sensor permits penetrating smoke, fog, haze, etc. Additionaly, it enhances day operations where thermal signatures may negate camouflage or cue gunners to "hot" targets. TADS FLIR has three fields-of-view and a zoom capability with magnification of: NFOV (zoom), 34×; NFOV, 17×; NFOV, 5×; and WFOV, 1×.

d. Laser Rangefinder/Designator (LRF/D). Provides the laser designation essential for laser-homing weapons such as HELLFIRE. Since all sensors are boresighted to to a common line-of-sight, the laser can be used to attack targets with any of the above TADS sensors. Also provides accurate range information to the fire control computer.

e. Laser Spot Tracker. Provides for target handoff and cueing by pointing TADS to a target being lased by any other source.

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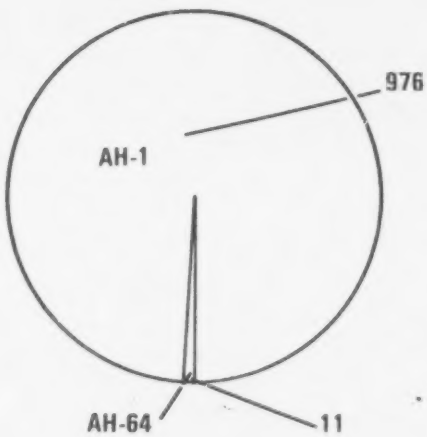
[1] NFOV—Narrow field of view.
[2] WFOV—Wide field of view.

f. Pilot Night Vision Sensor (PNVS). Provides the pilot with a thermal image of the surrounding terrain used for pilotage and navigation. Utilities FLIR technology, thus is also totally independent of visible light. Has a single magnification of 1×.

g. Demonstrated range capabilities of the TADS sensors are: Day TV [deleted]; Direct View Optics [deleted]; and FLIR [deleted].

ATTACK HELICOPTER ASSETS - END FY 82 FDP



TOTAL ASSETS: 997

General MERRYMAN. What this slide shows you, Senator, is the attack helicopter assets we will have at the end of the fiscal year 1982 funded delivery period. Note that there are 11 AH-64's and the rest are Cobras which you are familiar with.

The next slide, please.

Senator GOLDWATER. Let me interrupt once again. Do you know if the HIND has this night vision?

General BROWNE. Senator Goldwater, I understood that you were going to be interested in this aspect. So I did put this comparison together for you. This is the HIND-E and that is our advanced attack helicopter. There is our sight that we are talking about. This is the pilot's night vision system. While it is very closely colocated with the sight, it is totally independent from it.

Now on the HIND this is their kind of sight combination gun turret. What I have done is try to pull these out for you to show what we in our intelligence community think is in that turret which compares to our turret.

You have the possible [deleted] system in here, you and a [deleted]. You have an [deleted] for their missile in this pod that would be similar to our laser in our turret that guides our missile. Then you have a possible [deleted] for copilot gunner in this system and we think that is what their system is comprised of.

That allows them some night and some longer range engagement. We believe that our sight, because of the state of the art of

the technology in this country, is more capable, but fundamentally you have the same kinds of equipment and a desire to stand off from the attacking force and be able to kill those attacking forces while staying outside the lethal range of those weapons that come with that attacking force.

That is what the sight really allows us to do. The closer you have to get to the enemy to be able to kill him, the more opportunity he has to kill you. This sight keeps us back outside of that critical fire zone and allows us great exchange ratios in killing their tanks without losing our systems.

General MERRYMAN. Put on the DIA backup. [Chart deleted.]

I have a slide, Senator, that you saw yesterday that bothers me as much as I am sure it bothers you all.

Senator GOLDWATER. Of course, that top line is an amazing thing to me because it has just been recently that Soviet doctrine recognized the helicopter as a viable infantry weapon, and now they have gone over the moon.

General MERRYMAN. The first time I appeared before this committee in 1973 I came over and told you that the Russians looked like they were building, a helicopter called the HIND. I was as surprised as to what was going on, you know, as the committee members. In all honesty, I was also surprised when I saw this latest DIA slide because I did not know that the numbers were so high. What that slide shows you is that for the last 10 years that is where they placed their emphasis, a [deleted] percent increase.

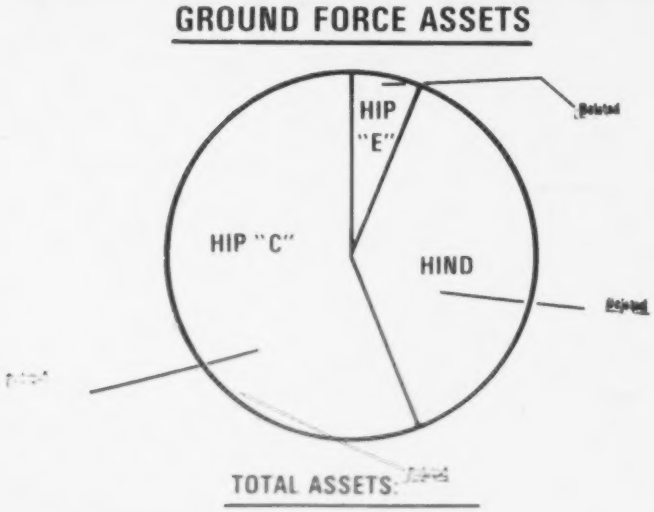
What that tells me is that we need as good a weapons system as possible because [deleted]. They have [deleted] HIND's now, as you probably know, in the Soviet Army. Now they have built about [deleted] but [deleted] is what the intelligence guys tell me are there today.

They also have some [deleted] HIP's in their Army. They are building HIND's at a rate of [deleted] a month.

Senator GOLDWATER. [Deleted] a month?

General MERRYMAN. Yes, sir, [deleted] a month. And they are building HIP's at the rate of [deleted] a month. Not all of those HIP's, Senator, are going into the Army. They put a lot of the HIP's on the civilian market. Some of the HIP's are only lightly armed and some of them are not armed at all. But if you just take HIND's alone, they have produced [deleted] and they have [deleted] in the Soviet Armed Forces and they are producing [deleted] a month. So you can get an idea of where they are going to be in a few years.

SOVIET ATTACK HELICOPTERS



Senator GOLDWATER. They are there now.

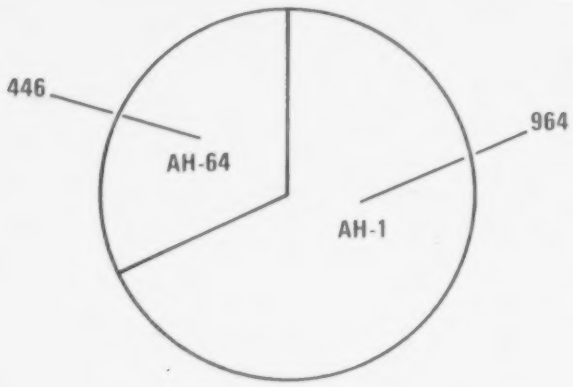
General MERRYMAN. That is correct.

Senator GOLDWATER. Well, if we can get the price of that 64 down we might buy some of them. We need a hell of a lot of them. We don't need just 20 or 30.

General MERRYMAN. That is right.

This gives you feel, sir, for what they do have, and I have talked to the HIND number. The HIP-C is an armed helicopter. The HIP-E is the most heavily armed helicopter in the world. It actually has more armament on it than the HIND does. You will notice they don't have many. As a matter of fact, to give you some sort of feel, they have [deleted] a [deleted] gun. That compares to only [deleted] those rocket pods on the HIND. That is where they are today.

ATTACK HELICOPTER ASSETS - END FY 87 FDP



TOTAL ASSETS: 1,410

This slide shows you sir, where we should be at the end of the fiscal year 1987 funded delivery period.

Senator GOLDWATER. That is assuming you get the buy.

General MERRYMAN. Yes, sir, that is assuming we get the buy.

Senator GOLDWATER. How many Cobra's do you have?

General MERRYMAN. That number there is 964. The AH–1 is the Cobra, sir.

AH–64 FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement—48 AH–64's.
Advance Procurement—96 AH–64's for fiscal year 1984.
Development and qualification of test program sets for automatic test equipment.
Qualification of composite main roter blade.

This is what the 1983 dollars that we are asking you for, will procure and be expended for in R. & D.

Senator GOLDWATER. Now they have been researching and developing that aircraft for how long?

General BROWNE. Nine years.

Senator GOLDWATER. 1972?

General BROWNE. Right, sir.

General MERRYMAN. What this is, Senator, my notes tell me, is a development, qualification, and test program equipment.

Senator GOLDWATER. That is a long time. You didn't hear about the HIND 10 years ago?

General MERRYMAN. Just barely.

Senator GOLDWATER. It was a whisper. Have you approached the Secretary of Defense with a full buy contract on this?

General MERRYMAN. No, sir, but it is our intent to, do so. One of the game rules for multiyear contracting is that we must have a stable program. This one must now settle down. In other words, we

must get started. The current thinking is that the program may stabilize in fiscal year 1985. Then we would look at multiyear.

Senator GOLDWATER. Are you satisfied with engines now?

General MERRYMAN. Yes, sir.

Senator GOLDWATER. Is that a Garrett engine?

General MERRYMAN. General Electric.

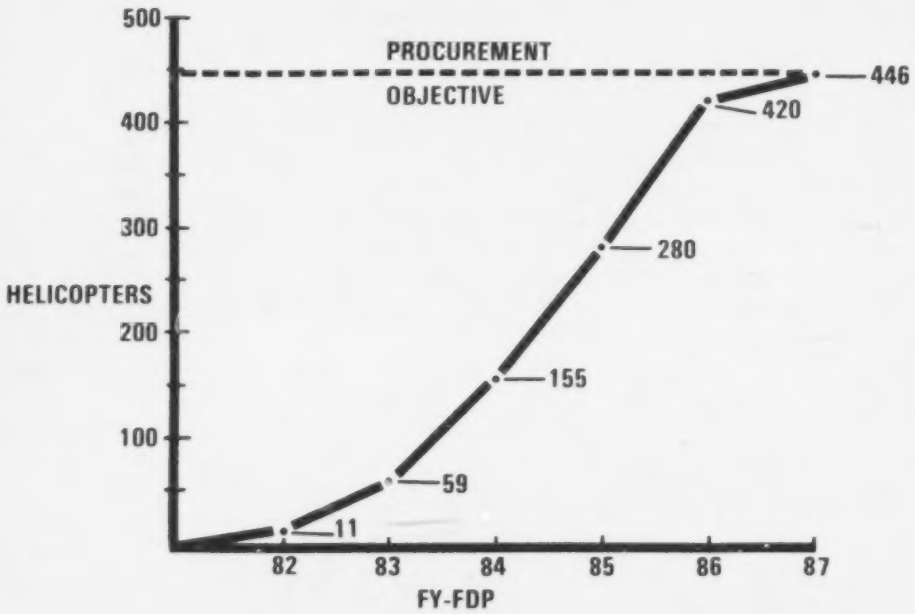
Senator GOLDWATER. What is the shaft horsepower?

General BROWNE. About 1,673.

Senator GOLDWATER. And you have got two of them?

General BROWNE. Right, sir.

AH-64 PROCUREMENT OBJECTIVE



General MERRYMAN. What this slide shows you, Senator, is the way that we would propose to reach the procurement objective of 446.

At this time, with your permission, I have asked the PM to pick you on the program status and tell you what he and the Under Secretary have been doing in the last 3 days.

Senator LEVIN. I am wondering if I can just ask a couple of questions here, Mr. Chairman.

I hate to interrupt you in the middle, but I may have to leave in a couple of minutes.

Have we looked at the possibility of upgrading the Cobra since our hearing on the AH-64?

General MERRYMAN. We had looked at it actually before, sir. About 2 years ago we looked at several possibilities. We looked at the possibility of using Blackhawk for the AH-64 role, and we

looked at three derivatives of the Cobra. We found out then that it would cost just about as much and you still wouldn't get the same bird or a similarly capable bird. Our latest analysis by the same organization in St. Louis reveals exactly the same thing.

Senator LEVIN. So if you gave the Cobra and the Hellfire the same kind of weather capability and sighting, assuming you could do that, it comes out to cost the same as the AH-64?

General MERRYMAN. It is in the noise level as far as difference is concerned and you would get it 4 to 5 years later, sir.

The PM has a slide which I would like for you to see.

Senator LEVIN. Well, I don't want to break the continuity. If you are going to get to that, fine.

General MERRYMAN. He has the slide, Senator.

It was an attention-getter for me. It essentially goes back to the Cheyenne which you may remember, was the Army's attempt to get an attack helicopter in the seventies or actually in the late sixties. That development began about the same time as the Russians started. You know, where we are today and it is kind of a sad story.

General BROWNE. You have mentioned why does it take so long and you have asked me that several years running, Senator Goldwater, and I put this slide together for this year, as I expected the question, and perhaps I can answer it a little better.

Senator GOLDWATER. I am not criticizing the Army. This is standard procurement no matter what we are buying.

General BROWNE. But there is a philosophic difference. This tells you how their philosophy functions. We started in 1962 with a thing called the Cheyenne, as you well know. We built 10 of those and then we terminated the program in 1972.

In 1968 the Russians came aboard with the idea of attack helicopters as contributors on the battlefield more so than many other things and we are going after them.

They started their design effort on the HIND, the "A" model in about 1968. In 1972 they put it in the field in the hands of troops. Their philosophy is get it out of development, put it in the field and then improve it once you have got it there and work the bugs out at that point in time.

Our philosophy hasn't necessarily worked in the same direction. We strive more, in my opinion, to get a more perfect article before we produce it and then we shove it out the door and that takes us longer.

In the meantime as we go to 446, as General Merryman pointed out, their build rate is [deleted] per month. They are producing at [deleted] month. When we have our 446 in the field they will have [deleted] roughly.

Senator GOLDWATER. I want you to keep in mind that nobody argues about the performance. What we are interested in is the cost. That is all we care about.

General BROWNE. I understand. As we are also, Senator Goldwater. We do not like the cost proposals we got. I am the guy that stopped the train, went and reported in and showed them how much there is. I dug in my heels with the contractors and said we are not going to pay that because I don't believe it, first of all.

Now when we get to where we have a realistic, rational agreement on the cost, then we obviously, if we are going to have this fighting system, are going to have to pay the rational price for it, but we are not going to leave any stone unturned in making absolutely certain that the costs that are proposed are truly what is required to build it.

Senator LEVIN. How about reintroducing some competition on the subcomponents?

General BROWNE. We are attempting to do that, but to really get competition on the subcomponents you truly have to have your first production in hand with a validated data package, a tech data package that you then hand to someone else and say bid on that for me and tell me how much he will do it for.

Senator LEVIN. Are you intending to do that?

General BROWNE. Oh, absolutely. I have a number of candidate systems in fact right now. The armored seat in this vehicle looks to me like a supergood candidate. We have got a guy out in the industry that says he will build it cheaper. We are asking him to submit his proposal to us. I have got the landing gear being broken out because many people can build landing gears.

So there are a lot of things that as we get our technical data package verified we will put out for competitive breakout bids and we will take the best supplier.

QUALITATIVE COMPARISON

Senator LEVIN. Can you give us a word on qualitative comparisons between the two helicopters?

General BROWNE. Yes, I can. This airplane is a very capable aircraft. The HIND is nominally a 25,000 pound airplane. Ours is about a 16,000-pound airplane max gross all up. Our normal fighting weight when we go out with a load of 8 missiles in a hot day environment will be about 14,600 pounds. This airplane is around 20,000 pounds going out.

Our aircraft we believe is much more agile in the nap of the Earth environment. This airplane was built more for speed and initially it was designed to have sort of like a gun run typical to a fixed-wing aircraft when it comes [deleted].

We have learned through our experiences in our tactics and doctrine that you survive better by scooting though the nap of the Earth, using Stealth and keeping hidden. As you then find our targets then you pop up, engage that guy while he still doesn't see you, kill him and pop back down to the nap of the Earth and then go away and find you another target.

We don't believe this airplane has the capacity or the agility at the nap of the Earth and the power-to-weight ratio for vertical rate of climb in hot altitudes and temperatures that we have.

We carry 16 antitank killing missiles in Europe and we can carry 1,200 rounds of our 30mm cannon ammunition with us as well and fuel for a 2½ hour mission.

The HIND carries four antiarmor missiles. We are now seeing through some of our defense intelligence stuff an additional two rails which would give him six antitank missiles and he carries rocket pods, for 37-count rocket pods, and then he also has a

12.7mm Gatling gun in its nose. This helicopter may in the future have [deleted] gun.

But firepower for firepower the Apache has more of it.

Senator LEVIN. How much more?

General BROWNE. Well, if you want to count tank killing capability, ours is better than his.

Senator LEVIN. How much longer can the HIND fly?

General BROWNE. The HIND is about a [deleted].

Senator LEVIN. So it is about equal in endurance.

General BROWNE. It is about equal in endurance. We think that ours is more survivable. We built this system with the types of materials that would allow you to take hits and survive. In fact, when Senator Goldwater saw our display on that, we had actually shot the system through all of the significant components with 23mm HEI ammunition and the components still work and you can continue to fly the airplane. It is a rough bird.

Senator GOLDWATER. Let me ask you. We have had an allegation made to us by Hughes that the Army's management reserve funds was very excessive. Could you comment on that?

General BROWNE. Well I didn't know that they had made that statement, but we do have a management reserve that the Army believes is needed to be able to comfortably tell you that we will be able to produce the aircraft and buy the program for what we have told you. That is, as the Under Secretary explained to you on February 4, that is a $528 million add-on to my estimate as a contingency for what the Army thinks considerations might come up in terms of risk as we march through the program.

I want you to clearly understand, Senators, that I don't intend to spend that money. My purpose is to buy the Apache for what my team estimated it at, and I believe so far that I will be able to do that.

Now, I do have an agreement with the Under Secretary and the Army that if I am able to do that, then I will take that $528 million and I will turn them into additional aircraft over and above that 446. If I do my calculations correctly and get that accomplished properly, we ought to have about 505 aircraft instead of 446 for the same budget that we are showing you that we are requesting. But that contingency fund is in there in the event that, for unforeseen reasons today, we in fact have to spend that money.

General MERRYMAN. Let me clarify that a little bit, Senator Goldwater. That goes back to some things I said earlier. I certainly hope, as you do, that what Hughes is saying is right. If so, then we can use those dollars for something else. What happened here, sir, is that the PM came in with his estimate, which he thinks is right, and I certainly hope he is right, but the Army's leadership thought that the number was too low. The management reserve was added, because in their collective judgment the Apache was going to cost more than the PM and Hughes thought it would.

We are all hoping we are wrong, but prudent management and our promise, like we were talking about earlier, to budget to the most likely cost dictated that we take the steps that we did.

Senator LEVIN. How much of that $580 million is in this year's budget?

General BROWNE. I don't have that exact figure with me. Let me get it for the record.

[The information follows:]

$47 million of the $528 million is in the fiscal year 1983 budget.

Senator LEVIN. Is that identified?

General BROWNE. Yes, it is.

Senator LEVIN. Well, would we know how much is in it by looking at our budget?

General MERRYMAN. I don't think you can, sir, because what is in the budget, as I understand, and correct me if I am wrong, is what the Army thinks each part of it is going to cost. So it is not broken out as to the level that it was the PM's estimate versus the Army. What you have is the Army's estimate.

General BROWNE. You have the Army's estimate and it is wrapped into it.

Senator LEVIN. Not your estimate?

General BROWNE. That is correct.

Senator LEVIN. Is your estimate lower than the Army's?

General BROWNE. That is right, sir. Well, I don't want to leave that connotation. We are all one Army here.

Senator LEVIN. Well, I know that. The final estimate is different from yours.

General BROWNE. That is right. My estimate is for the total program buy, $528 million less than the Army's position for the most likely cost. They hope I am right, and so do I, because then we will take that money and buy more helicopters with it.

General MERRYMAN. Senator Levin, its gets back to something, sir, that you missed. Prior to the time you got here I gave a little talk about some initiatives that the Army is implementing in order to try and get a handle on cost growth. We are constantly seeing every time we start a program, that the number is higher than we had planned on it being, and that is what happened here. In other words, our costers are now looking at what the cost ought to be, and when our costers say it is higher than the PM's, then we are going to go with that cost unless there are compelling reasons why not. That is what has taken place.

Senator LEVIN. I am wondering on that note, Mr. Chairman, if I could ask a question about competition—there was an amendment that Senator Cohen and I had worked on last year—and then I won't be interrupting too much more because I have to leave.

Senator GOLDWATER. That is all right.

SOLE-SOURCE CONTRACTS

Senator LEVIN. I guess Dr. Sculley is the right person to whom to ask this question. I introduced an amendment here last year, along with Senator Cohen and we were supported by the committee after modifying it to satisfy the Defense Department, which would have promoted competition by providing a little longer period for potential competitors to send in their offers once there had been publication of the intention to negotiate sole-source contracts.

We were trying to reduce the number of sole source contracts. That is presumably one of the initiatives which the Defense Department is promoting, one of Secretary Carlucci's initiatives.

We worked it out here. The Armed Service Committee on the Senate side adopted it. The Pentagon seemed to be satisfied with it. When we got to conference the Pentagon came around on the House side and was fighting it there. The House conferees were reading letters from the Pentagon opposing the amendment which we had worked out on the Senate side and the Armed Services Committee adopted.

Are you at all familiar with that amendment?

Dr. SCULLEY. Only in concept. I am not aware of any actions by the Defense Department to circumvent its intent.

Senator LEVIN. Well, I guess this is an item which we can take up again in full committee. It was the full committee last year which took it up and adopted it, but I thought I might raise it here today. I would hope that you take back a message that we try to give at a number of these hearings where we talk about procurement.

From last year's action of this committee I think we are determined to try to get these procurement costs in hand. Our amendment was one mechanism to try to do so, one of many, and the chairman here has been fighting this battle a lot longer than I have. But that was just one of many new initiatives and we thought we had the Pentagon supporting it. It did here. The Pentagon accepted this finally on the Senate side. Frankly, we were a bit nonplussed to find that the Pentagon then continued to object to this amendment.

Maybe you can carry back a message and give us for the record what the position is going to be this year. I guess you only can speak for the Army but maybe give us an Army position on what your feelings are about that amendment that was adopted last year to stimulate the amount of competition and to reduce the level of sole-source procurement.

Could you give us that for the record.

Dr. SCULLEY. I would be happy to provide that for the record.

[The information follows:]

The Army is actively pursuing methods to increase competition in the acquisition process. Goals for increasing contract competition have been established by all Army contracting activities and submitted to my office. Plans have been established and review by my office clearly indicate a responsible, positive response to the objective of enhancing competition. The plans will be periodically reviewed and refined to insure continued emphasis in this endeavor.

Senator LEVIN. I have a lot of other questions which I will just offer for the record, if that is all right.

Thank you.

Senator GOLDWATER. Thank you for coming.

General BROWNE. Senator Goldwater, just as a reminder for the rest of the members and the staff, we really have three major elements to this program. Hughes Helicopters is the prime contractor for the airframe and the integration and much of the development of the weapons per se.

The target acquisition designation site, the TADS that we referred to earlier, is built by Martin-Marietta and is furnished to them as government-furnished material. I buy it separately and hand it to them to keep a passthrough burden down.

Also, the Rockwell International Corp. builds the missile under contract with the Hellfire PM at Huntsville, Ala., the missile command, and I hand that to them as government-furnished material as well.

APACHE PERFORMANCE SPECIFICATION STATUS

4000'/95°F PRIMARY MISSION GROSS WEIGHT -701 ENGINES

KEY PERFORMANCE REQUIREMENT	MEETS REQUIREMENTS		REMARKS
	YES	NO	
CRUISE AIRSPEED -145 KNOTS TRUE AIRSPEED	145		AT MAX CONT POWER
VERTICAL FLIGHT PERFORMANCE 450 FT/MIN	935		AT 95% IRP - FOR 450 FT/MIN COULD INCREASE ENDURANCE + 40 MIN OR 620 LBS ORDNANCE (W/-701)
ENDURANCE - PRIMARY MISSION 1.83 HRS	1.83		
PAYLOAD - PRIMARY MISSION 8 HELLFIRE AND 320 RDS - 30MM	8/320		PAYLOAD COULD BE INCREASED TO 12 HF MSLS AND 415 RDS - 30MM AT 450 FT/MIN VERT CLIMB (W/-701)
ENDURANCE - SEA LEVEL STD - 2.5 HRS	2.5		

Now I would like to tell you as we are getting ready to go into this production effort that the system as it was modified with our 701 engines will meet all of the MENS requirements as you see here that were set for this system by a board of officers and updated over the last 10 years to make sure that we are fielding something that we need and that will meet the requirements.

In addition, because of this additional power on that engine we can increase the firepower of this system in the Mideast areas or in hot and high areas of the world by adding an additional four missiles to it and an additional 415 rounds of 30-millimeter ammunition and still be able to have the agility that we need to fight, that vertical rate of climb margin, the 450 feet per minute.

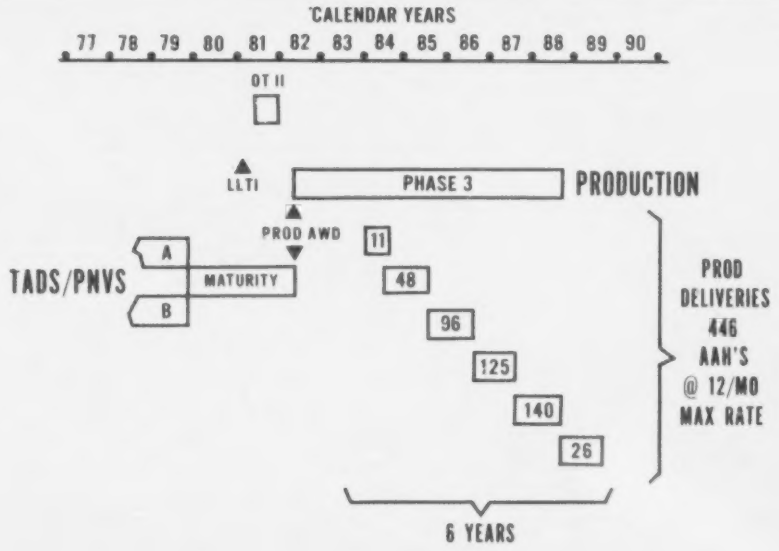
Our sight, the TADS, does in fact meet its requirements as well. In fact, it exceeds those requirements. As you can see here [chart deleted] we have a requirement for [deleted] detection. We have consistently been able to demonstrate it [deleted] beyond that, [deleted] at night for target detection with the FLIR. I won't go through each one of them, but this sight does do a significantly tremendous job of searching out and finding the enemy target for us to attack.

Now there has been some discussion about reliability and maintainability, and I am going to have a little talk with my TADS' PM about his two PH. D's. However, we have found that the soldiers in

the field do in fact operate on this equipment very well and OT–II showed that they can in fact keep this stuff operational, and the preproduction article, our latest prototype, AVO–6, was ready 80 percent of the whole time it was out there. It flew twice the amount of hours per month that we expect to fly in peacetime rate and we believe it will mature to the whole 100-a-month capability that we want for wartime.

In terms of production readinesss, I think that the community at large, including the independent evaluators, will tell you that this helicopter is more ready for production than any other system we have had in development in the past 20 years.

AH-64 PROCUREMENT PROGRAM



As we told you last month when we were with you on the 4th, we have in fact got a production ramp that builds to 12 a month at this point in time and then buys out to 446 by 1989. The reason that we went to that 12-a-month rate is it is the most efficient rate within the dollars available to the Army and it saves the taxpayer, instead of staying at an 8-per-month rate, $134 million over that procurement.

Senator GOLDWATER. Is it true that the 30-millimeter gun hasn't met its full specs?

General BROWNE. No, sir, not now. As I understand it we have in fact finished the reliability firings. The gun has met its requirements. There is a whole list of requirements for the gun. There is one specific requirement that from a hover on accuracy at 3 kilometers, instead of having I believe 12 rounds in the target area, it only has 10 rounds in the target area. But all others during maneu-

vering and shooting off axis, the copilot gunner can be shooting with the missiles this way and the pilot can attack a command and control vehicle, like a BMP, off axis with that cannon simultaneously.

So we have about 12 parameters of requirements for that cannon. It has met them all, except one, and it almost meets that and we believe we have a got a fix for it.

Senator GOLDWATER. Has the gun had a jamming problem?

General BROWNE. The gun per se has not had a jamming problem. We had a feed chute mechanism. You know, we have a linkless feed system, and the chutting mechanism was causing us to interrupt the feed of the bullets or the rounds to the cannon. But we have not had any significant jamming problem with the cannon at all.

Senator GOLDWATER. You have corrected the feed system?

General BROWNE. Yes, we have, sir. And we meet our probability of fire out and our MENS requirements today.

Senator GOLDWATER. What is the rate of firing?

General BROWNE. 625 shots per minute and we carry 1,200 rounds. Incidentially, it is a very lethal round. It is the world's smallest shape charge round. It is only about this big. It is not like the GAU-8 30 millimeter which is that big. But that little round can penetrate, and this is a classified figure, it can penetrate [deleted] rolled homogeneous steel armor at the ranges that we shoot at, and that is hitting it [deleted] which is our requirement, it penetrates [deleted].

AH-64
APACHE - FINANCIAL SUMMARY

$ IN MILLIONS, JAN 82 INDICES

	FY82 AND PRIOR	FY83	FY84	COST TO COMPLETE	TOTAL
RDTE	$1139.2	33.7	28.8	29.2	$1230.9
PROCUREMENT	$602.8	965.0	1440.6	3141.5	$6149.9
TOTAL	$1742.0	998.7	1469.4	3170.7	$7380.8

PROGRAM ACQ UNIT COST
(FY83 $)

FY76	8.717
FY82	9.585
FY83	13.729

COST GROWTH

FY76 - FY83	57%
FY82 - FY83	43%

Now in terms of our costs, sir, this is the standard chart. As you know, our total program, that is in R. & D., was $1.2 billion. It is $6.1 billion with the latest indices for 446 units. Our program unit costs from the development estimate in 1976, $8 million. In 1982 it is $9.5 million. In fiscal year 1983 it is $13.7 million. There is a rate of increase from 1982 to 1983 and the total of 57 percent is from the base year of fiscal year 1976.

Now, I have told you that I wanted to bring this slightly up to date with regard to where we stand with Hughes helicopters. This is a chart [chart deleted] that is similar to what you had in your package handout that the Under Secretary gave you on the 4th of February.

This is in essence the manufacturing labor-hour comparison that Hughes had proposed against what my team says it ought to be and we are progressing toward a rational figure.

Now, I want you to clearly understand, Senator Goldwater, that this is not the whole thing. This is a small piece. The reason we honed in on this piece is that these are the recurring hardware cost drivers, and if I can't contain these now in the out-years, they will jump up and bite us on increased costs-per-unit fly away.

So this is not the whole picture, and we don't want to give you the impression that we are that far apart on everything. It is in this particular area that we are far apart and we are honing down and bringing it into control.

Now "Rev." stands for revision. We have had three revisions to their proposal as it was submitted. Rev. 3, which is the latest one, which is about a week and a half old, is indicated by this mark here. This was Rev. 1, and it only had one revision and it was during the Rev. 2 update.

Now, as you can see, there has been some significant movement coming down as we continue our factfinding with Hughes helicopters.

The Army position, which was the middle position on "should cost" is indicated by the blue. We have come up some on these as well from information we have learned during factfinding. However, I have not put those updates on the chart so as not to compromise the Government's negotiating position as we get ready to go to the table on the 8th of this month with Hughes for hard-cost negotiations. But I can clearly and honestly tell you we are progressing, not as fast as I would have liked and we still have a way to go, but I believe it will reach a rational and a reasonable price for the aircraft in terms of what it takes to really build it.

In summary, Senator Goldwater, I would like to just revisit the lethality of this system for you. Cannon, missile and rockets, and there in the center are three target areas for those, and we do this in the dark of night. We can fire that missile without anybody seeing us or without any illumination and kill that tank. We have demonstrated it [deleted] at night and we can do it [deleted] during the day using our onboard sight, and if we have a remote designator we can lob that missile out [deleted].

So the system is tremendously lethal. We have been at it admittedly 9 years, and we are not necessarily all that proud of the time that it takes, but it is ready for production, and it provides a tremendous capability in terms of combat power to that combined

arms team that General Menetrey discussed with you that needs this modernized weapon.

Thank you very much, sir.

Senator GOLDWATER. We would like to reach a decision on this no later than the middle of April. The only reason we won't have it before then is that GAO is preparing some material for us.

Thank you very much.

General BROWNE. Senator Goldwater, we expect to have our deliberations hopefully concluded and be prepared to award contracts by the middle of next month.

Senator GOLDWATER. That is about the time I felt. Will you keep in touch with me on that, please?

General BROWNE. Absolutely, sir.

Senator GOLDWATER. I just want to thank you for the great job you have done with this aircraft. I have had the pleasure of watching you work on it. I hope that all of our PM's can do the same kind of job—just a little cheaper.

General BROWNE. Thank you very much.

You mentioned something earlier today about making sure the American people know what we are doing. I intend to do a bit of that. In fact, I am bringing the attack helicopter to Washington on the 15th through the 17th of this month. General Franklin will be contacting members of your committee and yourself and others to have them hopefully come out and have an opportunity to see this piece of equipment.

Senator GOLDWATER. Where are you going to have it, at Andrews?

General BROWNE. I am not sure yet, sir. We will alert you. I am negotiating now as to where is the best location to put it.

Senator GOLDWATER. Well, you can get more people out there. I think if you had a public demonstration of just what you are talking about, nap of the Earth. The average taxpayer doesn't know what you are talking about and the average Congressman knows less than that. So the more you can do to push it, fine.

General BROWNE. I would also like to say that while it is sometimes traumatic, the assistance that you have given us in terms of getting Hughes' attention has helped.

Senator GOLDWATER. I am cursed with a desire for thrift and a desire for aircraft. It doesn't always work out.

All right now we have this problem. We have to go into session today on the Senator Williams case. How much more time do you think you are going to need?

General MERRYMAN. Senator, we have several more systems. There are about 20 systems that we have not yet discussed.

Senator GOLDWATER. Would the 3 hours allotted to you tomorrow morning be enough?

General MERRYMAN. I have about five slides per system, Senator Goldwater. If I could go through the five and have the questions wait until then we might be able to do it.

Senator GOLDWATER. Well, I have other committee work this morning that I am missing. So would you object if I left and let my staff continue?

General MERRYMAN. No, sir.

Senator GOLDWATER. They are the ones that do all the work anyway.

General MERRYMAN. It is the same where I come from.

Senator GOLDWATER. I am just not here to hang an ornament on. So thank you gentlemen for coming, and I will see you tomorrow morning and these fellows will keep you honest.

[At this point Mr. Carl M. Smith and Robert S. Dotson, professional staff members proceeded with the presentation of the briefing.]

Mr. SMITH. Go ahead.

Army helicopter improvement program (AHIP)

Fiscal year 1983:	*Millions*
R.D.T. & E. request	$75.8
Weapons system procurement request	45.1

Scout helicopter compatible with Apache and Cobra attack helicopters.
Laser designation for Hellfire, Copperhead, and other precision guided munitions.
Provides platform for FA observation.
Development initiated in fiscal year 1981.
Fiscal year 1983—Procurement of long lead items.
Total buy—578.

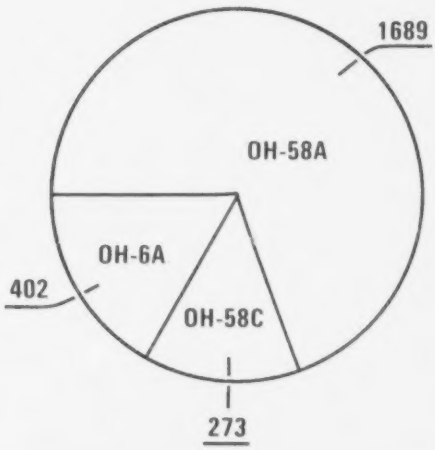
The next program is the AHIP program, or Army helicopter improvement program. This program provides the Army with a scout helicopter that can work with a Cobra, the AH-64 and also the artillery.

What you see in the picture there is a modified OH-58 with a mask mounted sight on top of it. It can support the artillery by lasing for Copperhead. It can also lase for the Hellfire missile on the AH-64 and it has optics that provides it the capability to see out as far as the attack helicopters that it is working with.

The big shortfall today, and I will show you another slide in a minute and show you the OH-58's that we currently have, is that they can't see out to where the Cobra sees, and they can't fly in the stringent, environmental conditions that the AH-64 is going to be operating in, and that they can't lase for the Copperhead missile for the field artillery. This system [AHIP] corrects all of those deficiencies.

What we tried to do here in all honesty is to take an existing airframe, one of the 58's, modify it to the extent necessary to give it the mission capability that it needs to enable it to fly in those parts of the world where it might be called upon to fly.

SCOUT ASSETS - END FY 82 FDP



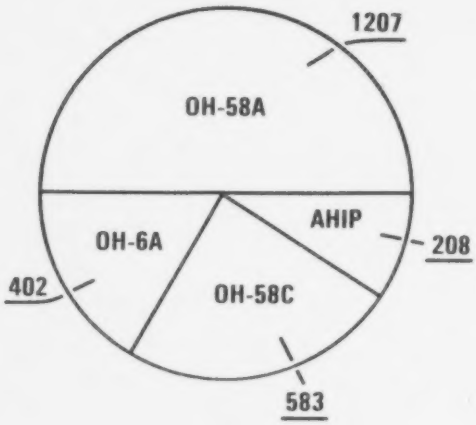
- TOTAL ASSETS 2400 AIRCRAFT

Now this chart shows you what we have in the U.S. Army today. Let me explain what these are in case you might not know. The OH-58A is probably something you are familiar with. We bought, as I recall, about 2,600 of these back in the sixties.

Going to the left, we have 402 OH-6's left, and these are in the National Guard. We bought about 1,200 or 1,300 of these, as I recall, during the midsixties. They were built by Hughes.

Now the next little block there, OH-58-C is a modification of the OH-58-A. You will notice that we have 273 of these. We are going to modify a few more. The modification provides a different engine to the A models, changes the plexiglass on the front, gives the cockpit a different configuration, and in all honesty it was a program that was thrown in as sort of an interim step when we failed to get a scout helicopter through the Congress a few years ago. Everybody realized we needed to do something and until we could get it sorted out as to where we were going to go, that was what this program was.

SCOUT ASSETS - END FY 87 FDP



TOTAL ASSETS - 2400 AIRCRAFT

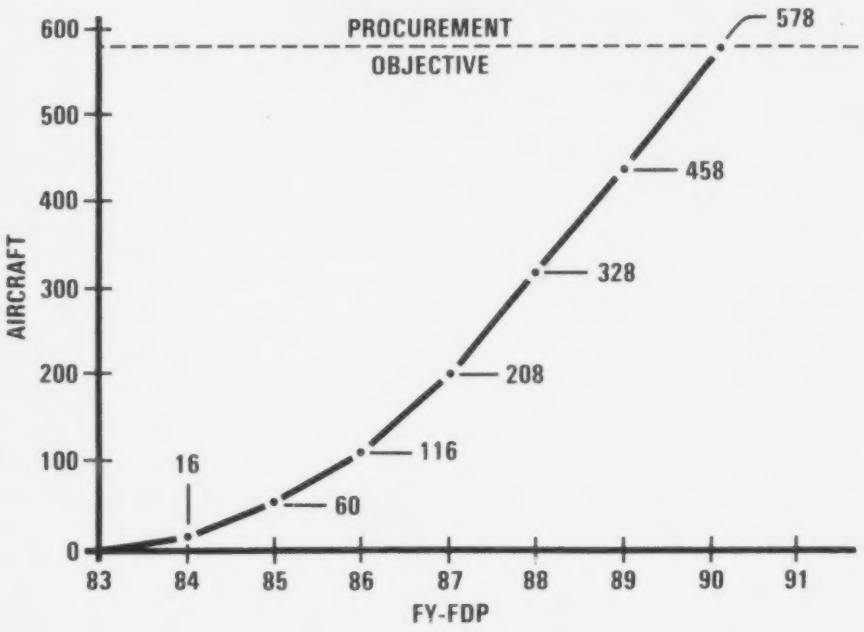
The Russians have helicopters that are used for reconnaissance, but they [deleted] as we are striving for. So what I am showing you here is where we will be at the end of the fiscal year 1987 5-year defense plan. Here you see at the top how many OH–58–A's there are left 208 AHIP's will have entered the inventory and we will have built up to 583 modified OH–58's and you see the OH–58–A's decrease in number because of attrition.

AHIP Fiscal Year 1983 Budget Request

Provides for:
Long lead procurements.
Integrated logistics support.
Assembly of 5 prototype aircraft.
Continuation of development.

This slide shows what the 1983 dollars will buy.

AHIP PROCUREMENT OBJECTIVE



This slide shows the procurement objective and how we would propose to get there, the number of helicopters bought each year.

AHIP—Financial Summary

Fiscal year 1983:	*Millions*
R.D.T. & E. request	$75.8
Weapons system procuement request	45.1

[Dollar amount in millions]

	Fiscal year				To complete	Total
	1981 and prior	1982	1983	1984		
R.D.T. & E.	$33.1	38.5	75.8	55.7	25.0	228.1
Weapons system procurement			45.1	167.4	2,091.0	2,303.5
Quantity buy			([1])	16	562	578

[1] Long leadtime items.

This is the financial summary showing the R. & D. up in the upper left, the procurement in the upper right. I think you are familiar probably with the format. You can see the fiscal year 1983 there and the total column out to your right.

Subject to your questions, we will go to the next one.

Mr. SMITH. General Merryman, what is the Army's AAO for the AHIP?

General MERRYMAN. Let me turn to the Army requirements man and see if he knows.

General MENETREY. It is that quantity. It is our procurement. We just went through that yesterday. I haven't given you the information available yet because we haven't run that off the tape. We are going to, I think, change our AAO's to agree with the amount that we intend to procure. In aircraft, it is a particular category, as you know, because there is no war reserve requirement, no POMCUS requirements and so on. It is a little different than some of the other equipment.

So let me provide that, if I could, for the record. I will give you the AAO.

[The information follows:]

The Army Acquisition Objective (AAO) for the Army Helicopter Improvement Program (AHIP) has not been changed. The AAO remains at 720 aircraft.

General MERRYMAN. Let me clarify. I know what your interest is. Let me tell you exactly what is going on.

The AAO, according to my buss sheet hasn't been changed from the older number 720.

Mr. SMITH. 720.

General MERRYMAN. Yes. What Lou is talking about is the fact that it may very well be changed down to 578. As I think I have told you before, what is happening here is that because of affordability, the Army made a judgment with its AHIP program back there the same way it made with the AH-64 program. Those, as a matter of fact, have been the first two programs that have come under the scrutiny, if you will, of what is falling out of all of those things I briefed on earlier today. In other words, when the AHIP project manager came in and said it is going to cost this versus this, the Army's leadership sat down and said, you know, we can't afford to buy this many at that price with the other things we need. Therefore, we reduced the quantity. The same was done with the AH-64 in a subsequent ASARC and that is how we arrived at that number.

General MENETREY. That is how it gets its name, AAO, Army acquisition objective, if you will. So we have certain difficulties with that. We have a procurement objective and an Army acquisition objective. But then when you structure the force and try to figure out how many attack helicopter companies, et cetera, then you have the hollow, if you will, part of the force that you don't equip.

The whole programing of the force over time is impacted by the number. I didn't say anything with the attack helicopter, but it is clear with those numbers that we are going to have a mixed fleet of Cobra's and Apache's to some degree for as long as we can foresee, and that is not enough attack helicopters, according to our exercises, war games, and models, that we could use in a heavy armored combat such as in Europe or perhaps some parts of the Middle East, but it is what we can afford when you look at the total mix of the Army and how to equip the total Army. So it is a difficult question.

Mr. SMITH. Just a year ago, General, the estimated cost for the AHIP was a total of $1.7 billion. It broke down into $168 million for R. & D. and $1.558 billion for procurement, and that was 720

aircraft. This year we are looking at $228 million for R. & D. and $2.303 billion, as you have on your chart, for procurement, a total of $2.531 billion for just 578 aircraft.

How do you account for that dramatic increase if in fact there is the same management reserve in this program that we have in the AH-64 now? Could you tell us how much of that increase is the result of the addition of the management reserve?

General MERRYMAN. When you refer to management reserve, that may be a misnomer. In the case of the AH-64 it was a case of looking at what the PM said he thought it was going to cost and we changed the number because we thought the number was higher. I don't think we did that in this instance. I don't remember. I wasn't at the ASARC. I don't know the answer. Let me see if General Maloney knows. Do you know the answer?

General MALONEY. There was not a management reserve.

General MERRYMAN. There was no management reserve. Let me just provide that so it will be straight.

[The information follows:]

There was no management reserve added to the Army Helicopter Improvement Program (AHIP) by the Army Systems Acquisition Review Council (ASARC).

Mr. SMITH. If I may, I will submit this for the record. This has the specific questions on it. Please continue.

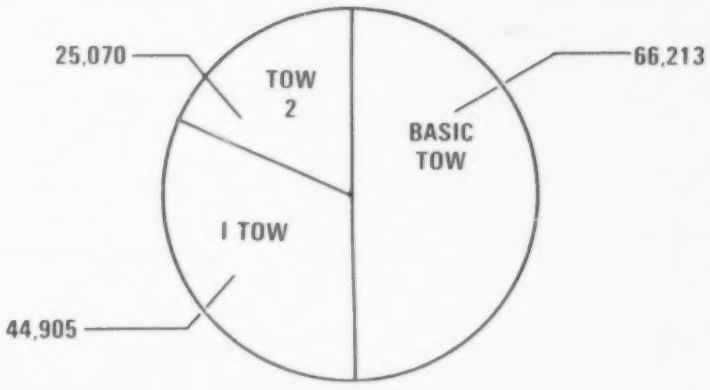
General MERRYMAN. Good. Thank you, sir.

What this slide shows are the three TOW's [chart deleted]. The TOW on the left is the TOW that you are familiar with. The TOW in the middle is the improved TOW. The TOW on the right is TOW 2.

As I mentioned earlier, we have had basic TOW in the inventory for years. [Deleted.] That is why we came up with TOW 2.

I-Tow, the one in the center is being fielded. You will notice that here we are asking for our third-year production dollars for the TOW on the right. It is on track and on schedule. The charts tell you what it does.

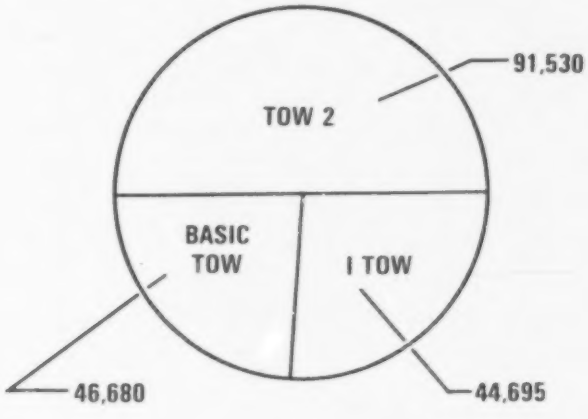
TOW ASSETS - END FY 82 FDP



- TOTAL ASSETS - 136,188

This shows you what we have at the end of the fiscal year 1982 5-year development plan.

TOW ASSETS - END FY 87 FDP



- TOTAL ASSETS - 182,905

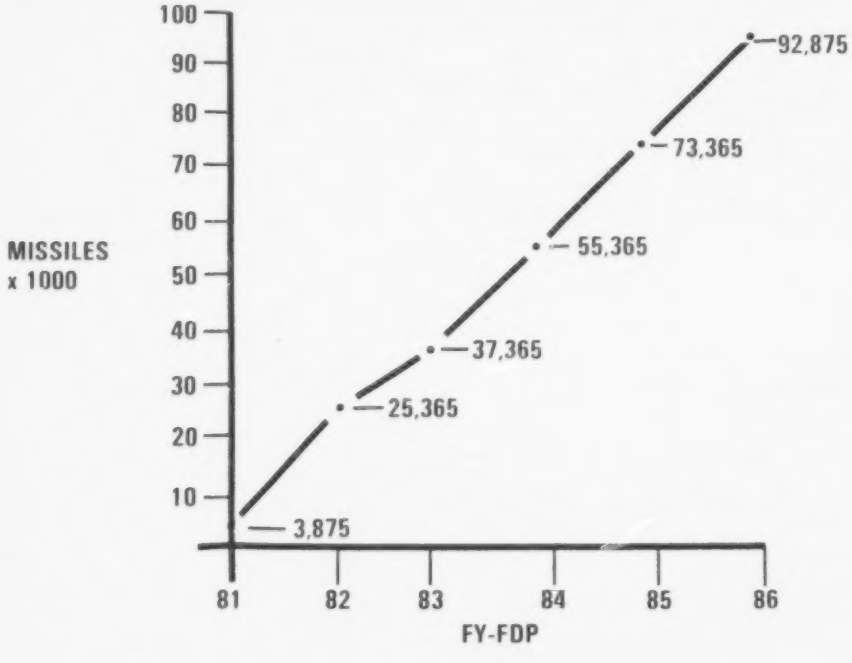
This shows you where we will be in 1987.

TOW 2 FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement—12,000 TOW 2 missiles.
Conversion—1,427 launchers to TOW 2 configuration.
Development of test equipment.

This shows you what the 1983 dollars buy.

TOW 2 PROCUREMENT



This shows you where we are going procurement-wise.

TOW FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E	195.4	6.569	1.981	1.967	—	205.527
$ WPN SYS PROC	1006.4	97.1	145.2	223.9	513.3	1985.9
QUANTITY BUY	145,068	12,000	12,000	18,000	37,510	224,578

$ (000,000)

This gives you the financial summary and here again it is clear, and there are a couple things I need to tell you here.

We do have a cost problem. You will notice if you look in the 1982 column. Now what you see there is printed and that is what you got, you know, that is 5-year development plan. That is the printed document. It shows that for $97 million we hope to buy 12,000 missiles. I have been informed that we are not going to be able to buy 12,000 missiles but we will buy 8,725 on a firm fixed-price contract.

Now I learned about this as a result of problems they had had with the 1981 contract which indicated that there were insufficient dollars in 1982 and 1983. The number has been fixed in 1983 so that the number you see there, $145,000 for 12,000 should be adequate to buy what you see. But the 1982 column, the dollars are insufficient.

Other than that, I know of no other problems in the program. For the record I should tell you that the missiles have performed superbly. They have exceeded what we expected.

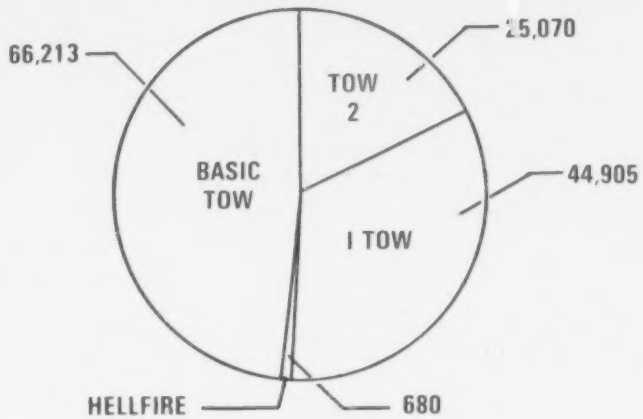
Hellfire

Fiscal year 1983:	*Millions*
R.D.T. & E. request	$19.3
Weapons system procurement request	267.5

Long-range antiarmor weapon.
Air and ground launch.
Direct/indirect firing mode.
Fiscal year 1983—2d year of procurement.
Total buy of 35,756 missiles.
680 procured through fiscal year 1982 FDP.

Hellfire, as you know, is the antitank missile that we will put on the AH–64 and we are also examining other potential uses for the missile. [Deleted.] It is faster than TOW. It will penetrate [deleted] rolled homogeneous armor. This will be our second year procurement. Its performance thus far has been superb.

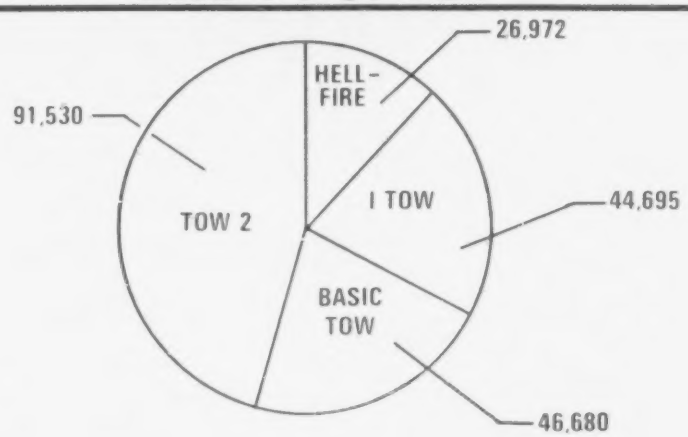
AIR/GROUND HEAVY, ANTI-TANK ASSETS - END FY 82 FDP



TOTAL ASSETS: 136,868

This shows where we are with air-to-ground missiles. What I am showing you here are not additional Tows but it is the same Tow chart that I showed you before with [deleted] Hellfires that we will have at the end of fiscal year 1982.

AIR/GROUND HEAVY ANTI-TANK MISSILE ASSETS - END FY 87 FDP



TOTAL ASSETS: 209,877

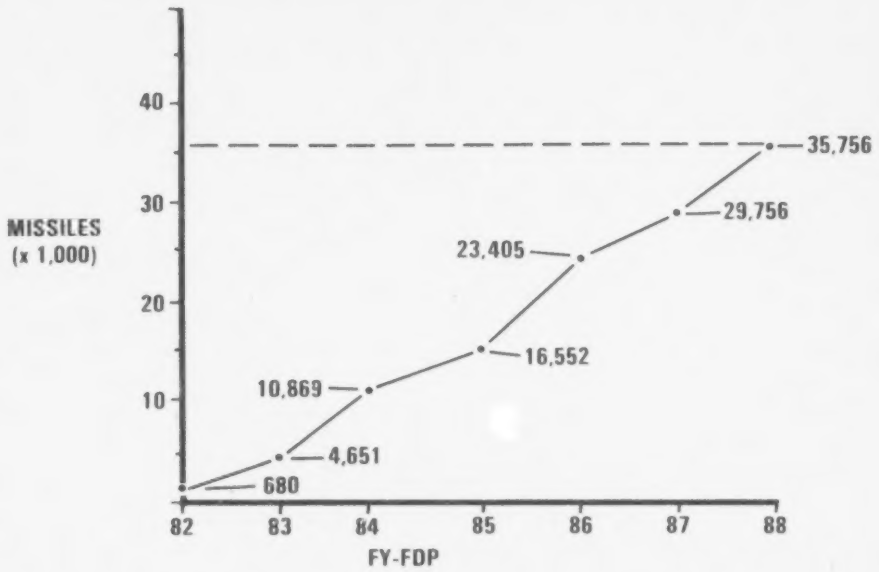
This is 1987. It shows you where we will be. By that time we will have [deleted] Hellfires.

HELLFIRE FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement of 3,971 missiles and 338 launchers.
Testing of minimum smoke motor and deicing kit.

This shows you that we will buy with the 1983 dollars.

HELLFIRE PROCUREMENT OBJECTIVE



This shows you how we plan to buy this out to the procurement objective.

HELLFIRE - FINANCIAL SUMMARY

PROGRAM UNIT COST
(CONSTANT FY 83 $)

DEV EST FY 75	40.2
FY 82	59.7
FY 83	50.5

($ x 1,000)

COST GROWTH

FY 82-83	-15%
TOTAL	26%

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E	275.3	24.2	19.3	.3	18.6	337.7
$ WPN SYS PROC	25.7	*121.1	267.5	275.5	1020.1	1709.9
QUANTITY BUY	——	680	3971	6218	24887	35756

$(000,000)

* INCLUDES $ 5M REPROGRAMMING

This is the Hellfire financial summary. Here again it is organized like all the charts.

If it is all right with you, rather than go through this, since you are familiar with it, what I will do is talk about why cost growth exists.

Mr. SMITH. Yes, sir, that is fine.

General MERRYMAN. You will notice that the cost growth in 1983 dollars is minus 15 percent in 1982 but 26 percent over the program. The savings are due to an increase in the missile quantity from about 24,000 to about 35,000 in the 1983 program. When you buy more, you know, it gets cheaper. Looking at the total unit cost growth of the program we see an increase of 26 percent. About 69 percent is due to estimating, 16 percent to engineering and 12 percent to schedule changes. The major estimating problem is due to the complexity of the system, and I am going to tell you about that.

Mr. SMITH. Is that in particular in the Seeker?

General MERRYMAN. I think the answer is yes. The Copperhead consists of about 1,200 parts. It leaves the tube at approximately 7,700 G's and was a complex technical challenge. I imagine this one had a similar problem, and General Maloney confirms that it did.

As times progressed and the complexities were solved the estimates have improved and many improvements have been made to the program, which were not in the original development estimate and have increased the cost and subsequent estimates.

Increased cost also resulted when we had to increase the diameter of the missile, from 6 to 7 inches, and we had to change the

missile container, and to reshape the warhead. All of those things are wrapped into this cost growth that you see here.

Schedule changes. A delay of production start of 1 year, which is in line with the AH-64, also, increased on the price of the missile.

General Menetrey now will take a few minutes and talk about the next subject.

Mr. SMITH. I have a question on this one, General Merryman. Last year because of cost growth in the basic laser Hellfire missile you elected to terminate the development of the fire and forget Hellfire. The Senate Armed Services Committee in its defense authorization work acknowledged that decision and endorsed it. It was also indicated that the Committee continues to support the effort to develop the fire and forget capability and directed that that effort continues under existing programs. No money was authorized for additional fire and forget effort.

What has been accomplished in the past year to developing that fire and forget capability, and is it the Army's intention still to ultimately have a fire and forget Hellfire?

General MERRYMAN. There is no line, to my knowledge, identified, but MICOM is working on that program. Let me check my memory here to make sure I am straight. The missile command is using dollars in the tech base.

Mr. SMITH. General, would you be kind enough to supply for the record a detailed answer to that question, just what the Army is doing and has accomplished over the past year and what are the Army's intentions now for the development of the fire and forget capability.

General MERRYMAN. We will be glad to.

[The information follows:]

In February 1981 an Army In-Process Review met to consider initiation of engineering development (ED) for the Hellfire Fire and Forget Seeker (HFFS). The Army determined that imaging-infrared (IIR) HFFS benefits were not significant enough in complementing the Advanced Attack Helicopter/Target Acquisition Designation System and laser Hellfire to justify initiating ED with high program costs and risks. It was determined that HFFS had technical concerns needing analysis, including missile rollrate, boresight correlator, seeker/missile/aircraft integration complexities, simulations/analyses, and focal plane array technology. The development cost estimate was between $500 million and $700 million with an estimated initial operational capability in fiscal year 1990.

The Army Missile Command is implementing a Fire and Forget seeker plan that begins in fiscal year 1982 with a joint Army/Air Force IIR seeker definition and technology demonstration. A technology development/advanced development program has been outlined that could transition into engineering development in fiscal year 1987.

The joint IIR program is a 6.2 effort (PE 6.2303A214) funded at $4 million for fiscal year 1982 and 1983. The requests for proposal were issued on 11 March 82 and responses are expected by 26 April 82 from about eight contractors. Up to four $1 million contracts are expected to be let on 16 July 1982.

Dr. SCULLEY. If I may, I might add that there is independent research being done in the private sector on fire-and-forget that I am aware of and have personally encouraged.

General MENETREY. I don't know how long you want to go. We are going to get into fire support and air defense, several systems.

Mr. SMITH. Let me ask you how much time you estimate you will need tomorrow. We will have a full 3 hours again tomorrow; however, we will run into the same problem with the Williams' floor debate.

General MERRYMAN. We should be able to do it. It depends on the questions.

Mr. SMITH. Why don't we take another half an hour now.

General MENETREY. OK, that is good. We will do air defense and that might be a good break.

General MERRYMAN. Yes; let's do air defense, if that is all right.

Mr. SMITH. That is fine with me.

General MENETREY. Going into the next mission area, air defense, and you realize all of these are interrelated, so it is just sort of an arbitrary rule to break them down into recognizable components.

Next please. The air threat in central Europe is shown here. I think since people have received the threat briefing none of this is a surprise. The numbers, especially the helicopters, which we just discussed a little while ago, are going up. That helicopter increase is clearly dramatic, far more so than the fixed wing increase on the Soviet side.

FAMILY OF WEAPONS

ROLE AND CURRENT FAMILY

Interceptor—F-4 and F-15
High and medium altitude air defense (HIMAD)—Nike Hercules and Hawk.
Short range air defense:
Missile—Chaparral.
Gun—Vulcan.
Manportable air defense (MANPADS)—Redeye.

Our family of weapons which you are familiar with and which we currently have, is shown here. Incidentally neither the Air Force nor the Army can do air defense alone. It is a combined effort, it has to be. I don't believe there is any question on air defense in this role.

Our HIMAAD, high-medium altitude air defense, now currently Hercules and Hawk, and as you know the Patriot program which we will talk about impacts in that area.

Our short-range air defense includes Chaparral, which we are improving, Hawk, and Vulcan which we are replacing with Divad. Our main portable air defense is currently the Redeye system. Redeye is being replaced with Stinger.

Generally speaking, in a tight setup, realizing that in Europe with the Hawk and other constraints it is not exactly this way, but this is our doctrinal employment of air defense where on the forward edge you have primarily a proliferation of man portable systems, in this case Redeye, up in the battle area.

Then as you get back further into the battle area you increase your capability at the higher altitudes with the Hawk, Chaparral, and Vulcan still back in your corps area and, in fact, on point defense even in back of that, such as airbase defense and others, and back further Hercules along with Hawk.

Looking at it from another slice, of course the standard altitude and engagement restrictions of the various means. The Air Force, needless to say, has to penetrate this zone either for air defense or offensive purposes, and therefore very close cooperation and control and identification are necessary for that purpose.

The same way as last time. Looking at the threat and our method of employment, our doctrine, and our concepts. In our current systems we come up with some shortfalls. We are too much in the visual mode of target identification. We are too much clear weather, too much manual, particularly in command and control, and our range is limited. Limited engagement in terms of the number of targets that can be engaged at the same time and that impacts on rate of fire. We are not taking advantage of some of the latest technology with our current systems. And our reliability is low, particularly in some of the older systems like Vulcan.

So that is the threat. Those are the shortfalls we are looking at. We are going to cover several air defense weapons systems that are in the 1983 budget submittal.

General MERRYMAN. You will see all these numbers again like you did last time and we will discuss the fire support area tomorrow.

AIR DEFENSE AND FIRE SUPPORT

[Dollar amounts in millions]

System	IOC [1]	Fiscal year—			
		1983 RDTE	1983 Procurement		
			FU	Missile	Amount
Air defense:					
Patriot	1984	$47.1	12	376	$881.0
Division air defense	1985	10.9	96		673.9
Stinger and Stinger post	1981	0		2,256	214.6
Fire support:					
Pershing II missile	1984	111.3	9	91	508.6
Multiple launch rocket system (MLRS)	1983	23.2	72	23,640	444.4
Fire support team vehicle (FISTV)	1985	6.9	[2]130		71.9
Field artillery support vehicle (FAASV)		0	[2]250		111.0
Remotely piloted vehicle (RPV)	1987	77.9			0
Copperhead	1982	2.1		7,629	183.6

[1] Fiscal years. [2] Vehicles.

Patriot air defense system

Fiscal year 1983:	*Millions*
R.D.T. & E. request	$47.1
Weapons system procurement request	881.0

Engages multiple targets in a sophisticated ECCM environment.
Replaces Nike Hercules and some Hawk.
Fiscal year 1983—Fourth year of production.
Total buy 103 batteries, 6,217 missiles.
19 batteries, 423 missiles procured through fiscal year 1982 FDP.

The first system is Patriot. Patriot, as you know, is the new medium and high altitude air defense system which we have been pursuing for several years. Fiscal year 1983 is the fourth year of production. We badly need this system in order to be ready to meet present and future threats due to both enemy aircraft in additional numbers and the electric countermeasures environment. Patriot gives us those capabilities. It is the centerpiece literally of Army air defense artillery modernization. It can simultaneously engage [deleted] targets while tracking [deleted] targets for a future en-

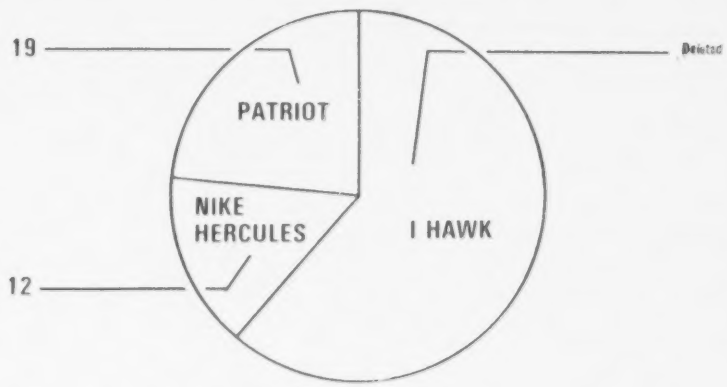
gagement and it provides a vital capability which currently does not exist.

In the past the Department of Defense and the Army have disagreed as far as Patriot readiness. Production therefore was limited, more testing was scheduled over the years, and I am happy to report to you today that most of this testing is behind us and the results have been very good.

Reliability has exceeded OSD criteria; missile flight tests, [deleted] have been successful; system performance, multifunction capabilities have been demonstrated, software endurance met OSD criteria; and search/track tests have met OSD criteria.

The project manager will address this in more detail and be able to answer any detailed questions.

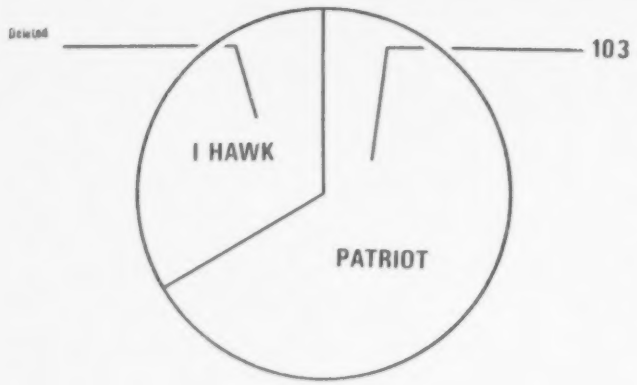
HIGH ALTITUDE MISSILE AIR DEFENSE ASSETS - END FY 82 FDP



TOTAL ASSETS Deleted BATTERIES

This shows you where we are today with what we have out there.

HIGH ALTITUDE MISSILE AIR DEFENSE ASSETS - END FY 87 FDP



TOTAL ASSETS [illegible] BATTERIES

This shows you where we will be at the end of the fiscal year 1987 funded delivery period.

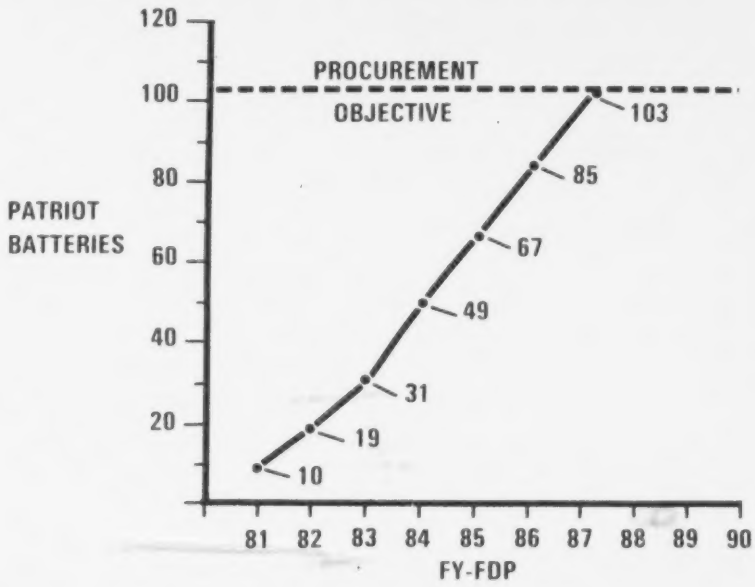
PATRIOT FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement of 12 batteries and 376 missiles.
Spares.
Follow on tests.
Patriot enhancement program.

This shows you what the 1983 dollars will buy.

This shows you the missile procurement objective buyout. We finish up there about 1990.

PATRIOT BATTERIES PROCUREMENT OBJECTIVE



The next chart shows you the battery procurement objective and how we buy the batteries out sooner.

At this time, if it is OK, the PM will present the financial summary and talk cost growth, test results, and international interests which I think you will want to know about.

PATRIOT - FINANCIAL SUMMARY

*PROGRAM UNIT COST
(CONSTANT FY 83 $)

DEV EST	
FY 72	41.277
FY 82	86.480
FY 83	98.942

COST GROWTH

FY 82-83	14%
TOTAL	139.7%

		FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E		1860.1	57.8	47.1	86.1	164.6	2215.7
$ WPN SYS PROC		943.1	755.1	881.0	1127.4	4791.3	8497.9
QTY	FIRE UNITS	10	9	12	18	54	103
	MISSILES	247	176	376	664	4754	6217

* 1 UNIT = 1 FIRE UNIT AND 64 MISSILES

$(000,000)

General BUNYARD. This is the same type of chart you have seen on previous systems. The 1983 buy, as General Merryman pointed out, is for 12 fire units and 376 missiles.

The program lead cost is shown here in constant 1983 dollars. The cost growth that is shown for the total system from 1972 to 1983 shows 139.7 percent.

The point to be made here is that we have deleted 132 fire units about midway during the course of the development of this system and thus going from 235 down to 103 which had a drastic increase in the unit cost.

Mr. SMITH. What was the reason for that reduction in the number of fire units?

General BUNYARD. The Army felt that they did not need that quantity. They needed 103 fire units.

General MALONEY. This was a major decision by the Department of Defense that we wouldn't have surface-to-air defenses in the continental United States.

PROGRAM ACQUISITION COST TRACK

	ESC millions	Percent of total growth
March 1981 SAR	$8,465.9	
Added scope	+1,778.5	79
8 versus 5 launchers per fire unit	(+1,372.1)	(61)
Revised maintenance concept	(+406.4)	(18)
Inflation	+232.4	10
Schedule stretchout (budget reductions)	+168.8	8
Outyear engineering	+63.6	3
Total growth	+2,243.3	100
December 1981 SAR	10,709.2	

General BUNYARD. What I would like to address next is the increase over this past year from March to the December SAR.

This is in response to the Nunn amendment. In the March 1981 SAR we showed this amount. The December 1981 SAR showed this increase of $2.2 billion. Primarily 79 percent of it is to added scope. Added scope goes to the 8 launchers per battery versus 5 and goes to the increased missiles, 1,944 missiles that are associated with the tactical fire units.

In addition to that, we have revised the maintenance concept and that is incorporated as far as added scope is concerned.

The inflation that you see depicted here, 10 percent of $232.4 million, is the January 1982 indices that we will apply to the program.

The schedule stretchout or budget reductions are reflective of the increase based on the $152.8 million that was reduced by Congress in fiscal year 1982.

In addition to that, we have to add the outyear engineering that is associated with that particular cost, for a total of $2.4.

The main point to be added there is the fact that 79 percent of this cost growth was to added scope, 10 percent inflation, 8 percent due to congressional cuts that we received last year and 3 percent was the outyear engineering associated with that.

Mr. SMITH. General, were there no increases that resulted from estimating errors?

General BUNYARD. No, sir. These aspects of added scope and inflation and schedule stretchout were out of my hands at that point. The engineering that is associated here goes with the engineering that you need, the configuration manager, the engineering change orders and the normal engineering that goes with any production as you go into the outyears.

General MERRYMAN. To make sure you understand what is happening here, in other words, you are talking from the SAR track.

General BUNYARD. Yes, sir.

General MERRYMAN. And you are thinking of the other charts. He is talking selected acquisition report [SAR] because there was an estimating impact in the dollar charts that I sent you that are not covered in this chart.

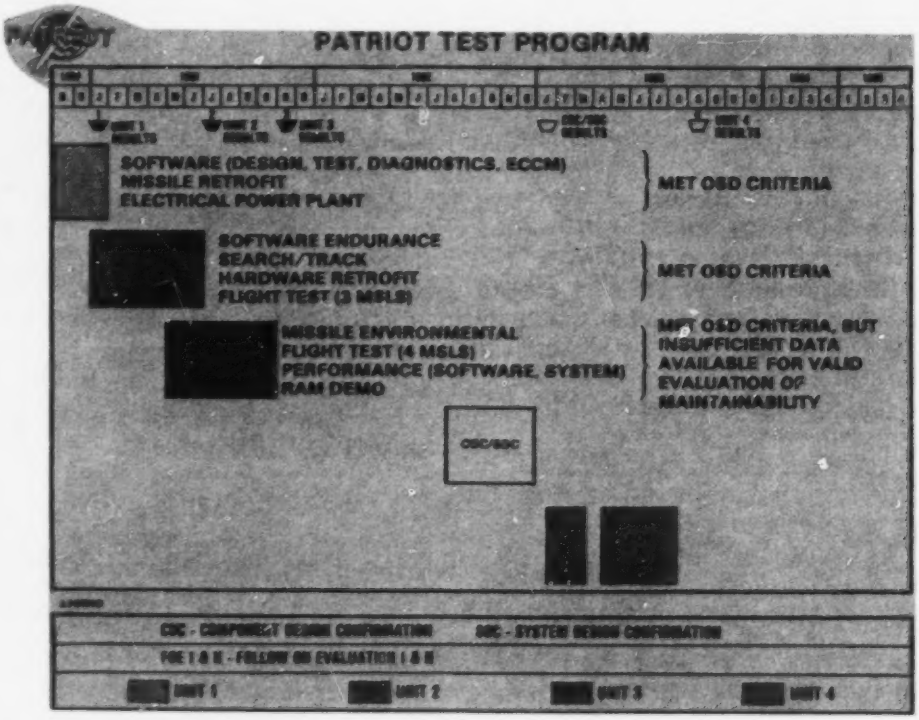
General BUNYARD. By virtue of the SAR rules, a certain portion of this added scope must be attributed to estimating.

Mr. SMITH. But the usual problem associated with estimating error is failure to meet learning curve objectives and whatnot, man-hours for production total. Those have not been problems with the Patriot; is that true?

General BUNYARD. Not in this particualr cost at this time. Now last year I did report some.

General MERRYMAN. If you go back over the program what you are looking for are the estimating figures that I provided to you. They reflect refined estimating techniques that indicate that early

estimates were low. System analogies were noted in the initial estimate. Then when the subsystems were defined, parametric estimating techniques were applied, and finally when the system was nearing design completion, bottom-ups engineering techniques were used. I think you have the number in the backup chart I have submitted to you.



General Bunyard. You are familiar with the test program that we have been undergoing. Just to make sure everyone understands, we were directed by the OSD memorandum to conduct a series of tests. They were broken out in units of testing.

Unit 1, which is shown here in yellow, was that test that was to be conducted by the contractor. It allowed him sufficient time to go in and make those design changes, both hardware and software, find, fix, and test, turn it over to the project manager in unit 2 testing where the project manager could in fact verify that the contractor had made those corrections, and then turn it over to the independent tester, the test and evaluation command of the Army to do an independent test. These are the changes and modifications made on the engineering development models, both hardware and software.

Also, within the memorandum were certain criteria that were spelled out. I have not highlighted all of them here, but these are

the main points. I think I have briefed you about the July timeframe and brought you up to date as far as up through unit 2.

Since that time, we have completed unit 3 on time. We did our missile environmental tests, we have met the OSD criteria. The flight test for missiles, we met that. We have met all of the performance in both software and in the system, and in the RAM demo, we did achieve over a thousand hours of RAM demo time. We accomplished it on time. Our goal at that point in reliability was [deleted] hours mean time between failure and we actually achieved [deleted] or three times the goal.

What that tells you from the statistics standpoint is that you have a 99.9-percent confidence that we achieved [deleted] hours mean time between failure of that fire unit, and that is the goal of the system.

The one thing that we did not achieve at that point in time of RAM demo was the maintainability.

When we briefed OSD back in January, and perhaps you may or may not remember that I pointed this out to you, but we indicated at that point in time that we would not make the maintainability because of the diagnostic software. We instituted the program at that time. In fact, we moved one of our fire units back up to the contractor's plant from White Sands to start working on that particular program. That program is continuing in progress to add to the data base that we achieved during the RAM demo to come up with our first maintainability baseline. In July of this year we hope to have that first estimate.

We again will go in and take a look at our maintainability as well as the system in total when the component design confirmation and the system design confirmation, which will be the first test that I will conduct on production models as well as the deployment software that we will use in the followon evaluation, which will be followed in the early part of 1983. This test will be conducted by the Operational Test and Evaluation Agency with the first Patriot battalion.

The first Patriot battalion will receive its equipment in January of 1983, go through their training and actually conduct the test, and reach their IOC at the completion of that test.

We will deploy the first unit to Europe in the January 1984 timeframe with an IOC of March/April of 1984.

INTERNATIONAL INTERESTS

	NATO	Japan
Relationship with United States	MOU with 6 nations (Belgium, Denmark, France, Germany, Greece, and the Netherlands) [1].	Acquisition study August 1982–January 1983
Production baseline	≈62–74 fire units	≈50 fire units
Decision to acquire anticipated	October 1985	December 1983
Type acquisition	FMS/Coproduction	FMS/Coproduction
First procurement funds planned	January 1986	April 1984

[1] Britain has expressed recent interest in Patriot.

The other area that I thought would be of interest is the international interest that has picked up considerably over this past year.

I have broken it out into the NATO arena and then in the Japan area.

In 1978 the United States entered into a memorandum of understanding with six NATO countries, as shown in this particular chart, with the idea of working with those countries to come up with an acquisition study and then an objective of how they would acquire those systems.

In August of this past year I made a trip to Japan to brief the Japanese Defense Agency as well as the Chief of Staff of both the Japanese ground and air self-defense forces. Considerable interest was shown at that point in time, and subsequent to that visit they have in turn made visits back to the United States, and just recently in this past month have now entered an agreement where we will conduct a study during the August 1982/January 1983 timeframe for the Japanese Defense Agency to make a determination as to whether they want to buy Patriot.

Here is what we are looking at as far as a production baseline, and this by no means should be interpreted as the number of fire units they are going to buy. It is a planning figure, if you will. We are talking about [deleted] fire units of the six countries that are interested in Europe and [deleted] fire units within Japan.

As far as the timeframe that a decision may be made to acquire this system, we are looking at about the October [deleted] timeframe for the NATO countries and December [deleted] for Japan.

The type of acquisition in both cases would be a combination of foreign military sales and full production. The first procurement funds that are planned at this point in time based on the last meeting of NATO was in January [deleted] and in April [deleted] with Japan.

One other item. Just recently within the last 2 or 3 weeks Great Britain has started to show increased interests as far as the Patriot is concerned.

That concludes my briefing, sir.

Mr. SMITH. General, on the issue of maintainability you deferred that aspect of the unit 3 testing because the system was apparently so reliable you did not accumulate faults on which to base a maintainability evaluation. What assurance can you give the committee now that the deferred maintainablity portion of that testing will not result in costly retrofits or modifications to the system once that demonstration or testing is completed?

General BUNYARD. I can give you a very high assurance because the modifications that we are making to the diagnostics is to the diagnostic software. There has been no indication of any hardware redesign that needs to be made.

This plan was laid out in detail and briefed to OSD this past month, or actually the latter part of January. It was approved for implementation and we are proceeding in that manner.

The primary area of concern was actually localizing the fault once it was detected. That is what the diagnostic software really does. It not only detects the fault, but it will also localize it right down to the printed circuitboard, and that is our shortfall today, and it is improving right along.

Mr. SMITH. The diagnostic software is independent of the missile. Are you talking about automatic test equipment?

General BUNYARD. Yes, sir. We have what we call the online system which is the status monitor and it tells the operator if he has a mission-essential problem and in that way he needs to start looking at the radar or some other battery replaceable unit at that point in time.

If it is interfering with his mission then he goes offline and puts in the tape for the diagnostic software which in turn will go in and diagnose it right down to the exact printed circuitboard, if you will, and he goes in and replaces that. He will have those spares with him at his location.

We have tried to simplify it as best we can with the operator and the operator maintainer.

Mr. SMITH. Thank you.

Mr. DOTSON. Relative to the cost of the program at this time last year what will the cost of improving and debugging the diagnostic software be approximately?

General BUNYARD. The total program for the diagnostic software only is $50.4 million. The total maintenance revision that I talked about was $406 million. The maintenance revision is incorporating the intermediate maintenace capability between the battalion and the depot. It is establishing a recertification of the missile, within Europe as well as in CONUS, and also establishing a capability within the depot of repairing printed circuitboards, if you will, at the depot as opposed to only the contractor facility.

Mr. DOTSON. Are the contracts for Patriot procurement in 1982 and 1983 fiscal years to be cost-plus type contracts?

General BUNYARD. Yes, sir.

Mr. DOTSON. Why is that?

General BUNYARD. They are cost-plus because we are still continuing going through the development cycle. We have these tests that are directed that I went through, and we going through that particular process. We get our tech data package late in 1982 or early part of 1983.

Mr. DOTSON. When do you anticipate transitioning to fixed-price type of contracts?

General BUNYARD. Right now we are looking very strongly at fiscal year 1984. 1983 is the one that we will still be going through our test process to July 1983 as a matter of fact.

DIVAD gun

Fiscal year 1983:	*Millions*
R.D.T. & E. request	$10.9
Weapons system procurement request	673.9

Air defense gun with significant improvements in acquisition, tracking, range and reaction time.
Replaces self-propelled Vulcan.
Fiscal year 1983 2d year of production.
Total buy 618 systems.
50 procured thru fiscal year 1982 FDP.

General MERRYMAN. This is the Divad gun. Currently the Army's forward maneuver elements lack adequate air defense. This need for such coverage has become more critical with the increasing threat from Soviet ground attack aircraft and attack helicopters. It has grown significantly in the past few years since Soviet close air support used to be nearly nonexistent. However, with the HIND,

HIP, and ground-support fighter currently in the inventory the threat exists and is considerable.

This chart highlights the division air defense gun program.

I should comment that the Government's hands-off skunk works acquisition strategy has worked exceedingly well. Two competitors worked for 29 months. Afterward, a fixed-price production contract was competitively negotiated. The system has done very well and we are shooting for an IOC in March of 1985.

Mr. SMITH. So what will be the total elapsed time, General, between the concept definition, if you want to use that for a starting point, and the IOC?

General MERRYMAN. 1978 was when they had the competition and we will IOC in 1985. So that is 7 years give or take a couple of months. That is pretty good. You know, we would like to do it faster.

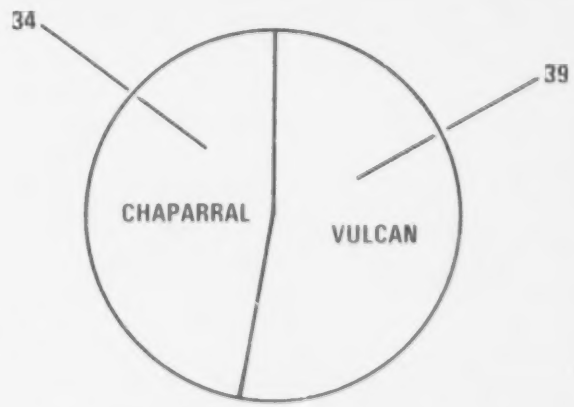
General MENETREY. That is all the way to IOC now. Sometime you measure that to production, but this is all the way to first unit equipped and initial operation capability.

General MALONEY. The first guns go under contract this year, and the first production rolloff is about 15 months from that.

General MENETREY. Yes. I think it is 1983, but I am not sure.

General MERRYMAN. So if it is 1983 you are talking about an even faster program. In any case, it has been done quite well timewise.

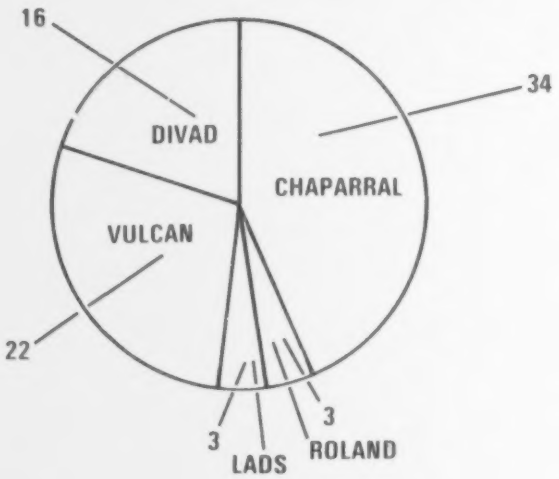
SHORT RANGE AIR DEFENSE ASSETS - END FY 82 FDP



TOTAL ASSETS: 73 BATTERI

This chart shows the current assets, Chaparral and Vulcan.

SHORT RANGE AIR DEFENSE ASSETS - END FY 87 FDP



TOTAL ASSETS: 78 BATTERIES

The next chart shows what we will have at the end of the fiscal year 1987 FDP. Now you see Chaparral on the right and you see Divad and you see Vulcan and you will notice I put a sliver in there on a thing called light air defense system [LADS].

We are looking at several things. We know that we need a light air defense system. We are looking at Stinger, we are looking at a light Divad, we are looking at towed Chaparral, and what I am trying to tell you by putting that sliver in there is that by the end of fiscal year 1987 FDP we would hope to have something that we would qualify as a light air defense system.

Mr. SMITH. General Merryman, last year members of the Senate Appropriations Committee recommended the termination of the Divad program, one or two members recommended that. Would you for the sake of the record here describe briefly the differences between the Vulcan system and the Divad system, please.

General MERRYMAN. The difference is considerable. The Divad, for example, has a range of [deleted]. The Vulcan is [deleted]. The Vulcan's target acquistion is visual. The Divad has a radar with an optical backup with a laser range finder.

Mr. SMITH. When you say a visual acquisition system for the Vulcan does that mean that it is entirely a manually operated sighting system?

General MERRYMAN. Yes, to my knowledge.

General MALONEY. It has a range-only radar but the gunner must acquire the target with his eye and point the weapon with his eye and keep it on the target with his eye. The radar follows his line of sight to give a range input to a computing sight.

Mr. SMITH. Does that fire proximity fused rounds or does it impact only?

General MALONEY. No, it is point detonated.

General MERRYMAN. The Divad can acquire targets [deleted] which is a significant improvement over the Vulcan.

Mr. SMITH. And the acquisition method for the Divad is entirely automatic? The radar does it for you and points the gun and determines the range?

General MERRYMAN. That is right.

Mr. SMITH. Is the Vulcan an all-weather system?

General MERRYMAN. No.

Mr. SMITH. Is the Divad an all-weather system?

General MERRYMAN. Yes. Do you have anything you want to add, General Maloney?

General MALONEY. I would say that the Divad has the armor potential to allow it to survive with the tank and the fighting vehicle at the forward edge of the battle area. The Vulcan mounted on the 113 without overhead protection does not have anywhere near the comparable survivability. In that connection also it is light years ahead of the Vulcan system.

Mr. SMITH. Let's compare the Divad briefly with the Chaparral. Is the Chaparral an all-weather system?

General MALONEY. The Chaparral currently is not all weather. However, we are procuring the forward looking infrared [FLIR] for the Chaparral which will give it a capability in most weather but not all weather. Once the forward looking infrared system is added to the Chaparral, it will be capable down to about [deleted].

So, although it is not fully all weather, it is most weather capable.

Mr. SMITH. What is the sighting method for the Chaparral, is it manual or is it automatic?

General MALONEY. The Chaparral uses manual sighting. When the FLIR is added it will still be pointed manually by the gunner, but then the FLIR can be used to acquire the target and automatically track it.

Mr. SMITH. Once you have locked on the target you can automatically track but you must still manually acquire and lock on the target.

General MALONEY. That is right.

Mr. SMITH. So the Divad is the only all-weather automatic acquisition antiair system that we have?

General MALONEY. In the short-range air defense, yes, excluding such things as Hawk and Hercules and Patriot, yes.

General MERRYMAN. There is another point to what General Maloney said there, too. You know, the Chaparral will go out to [deleted] less that [deleted] maybe. The gun, on the other hand, you see, is effective from the barrel out. So if you just had Chaparral you have got quite a void there.

Mr. DOTSON. Let me ask a couple of questions on Divad. Divad has recently completed a phase of operational testing; is that correct?

General MERRYMAN. That is correct.

Mr. DOTSON. What were the results of the operational testing compared with the criteria for successful tests, and specifically

were there reliability problems with either the gun barrel or the acquisition radar fire control system?

General MERRYMAN. I am not familiar with the name you used.

Mr. DOTSON. I am not completely familiar with the name of the test. It was a phase of operational testing.

General MERRYMAN. Just recently?

Mr. DOTSON. Yes.

General MERRYMAN. There were some problems with the ammunition feed chute that I am familiar with. They had a problem initially, as I recall, and General Maloney, correct me if I am wrong, where they had a motor that was more powerful than the chute could handle, and as a result you had jamming.

Mr. DOTSON. General Merryman, can you be specific. What was the criterion for mean rounds between failure and what actually occurred?

General MERRYMAN. I cannot. I will be happy to provide that.

Mr. DOTSON. Can you provide that?

General MERRYMAN. Yes.

[The information follows:]

The criteria for mean rounds between failure was 1500 rounds. Using only the data from the check test, the system achieved 365 mean rounds between failure. The check test was a small sample of the total number of rounds which have been fired and cycled through this system. During the DT/OT II, which was held in 1980, we demonstrated a 1350 mean round between failure on a much larger sample size. The type of failure which occurred can be easily corrected and we plan to demonstrate many of these corrections this summer. There is some risk that the program schedule may be affected by correcting these deficiencies. We feel the armament reliability will be satisfactory before the first production unit is delivered.

Mr. DOTSON. Also, the reliability statistic for the fire control system, what was that criterion and what was actually accomplished?

General MERRYMAN. I will be happy to provide both of them.

[The information follows:]

The threshold for the fire control subsystem of the Divad Gun was 50 hours mean time between failure. The system achieved 54 hours mean time between failure during the check test.

Dr. SCULLEY. We will be happy to provide both of those items for the record, but I think the record should show that we have had a problem.

Mr. DOTSON. All right, sir. And how about other performance criteria? Did the Divad show well in those areas as far as engagement ranges, lethality and that sort of thing?

General MERRYMAN. To my knowledge, yes, but here again to make sure that I am telling you correctly I will provide it for the record.

[The information follows:]

DIVAD GUN SYSTEM

The Divad Gun system performance was good in most areas during the testing. The system has successfully demonstrated 11 of 12 performance criteria. The system has performed well against such measures as probability of hit and probability of kill. The system has demonstrated the capability of successfully engaging targets at all ranges within the system range envelope. The only firm performance requirement which was not successfully demonstrated was IFF performance. The IFF experienced an interface problem with the DIVAD radar system. We feel the problem is

easily correctable and we plan to demonstrate the correction this summer. Additionally, the armament reliability was below our expectation. The problems experienced can be corrected with very low technical risk. We will verify many of the corrections this summer. We feel these shortcomings in system performance will have no affect on our ability to produce and field a DIVAD Gun system that meets all our requirements.

General MALONEY. May I comment?

General MERRYMAN. Yes, please.

General MALONEY. The check test results are currently emerging. They have been briefed up to the two-star level in the Army staff. They have not yet gone to the ASARC level.

The check test was intended to look at deficiencies that were noted during DT/OT. During DT/OT the system performed to about, well in a kind of general sense, about 80 or 85 percent of the level that we wanted it to perform, the winning system that is.

Mr. DOTSON. Eighty-five percent?

General MALONEY. Just looking at the whole system.

Mr. DOTSON. An overall collection of the statistics you were interested in?

General MALONEY. Yes, that is right.

General MENETREY. That was the OT now. That was the previous test and not the most recent one.

General MALONEY. This was the previous testing that was done in competition when we were looking at two systems. The winning system was given some time to mature and then brought back to a short check test at Fort Bliss to look at specific parameters that we didn't like during DT/OT.

Mr. DOTSON. This was an operational type test?

General MALONEY. Yes, it had significant operational flavor. The early results from that, and we don't have very clearly defined results now but they are being put together at this time. Those early results, and a single gun was tested only, indicated that there were problems in the feed mechanism and those appear to be the most significant problems that we saw during the check test.

There were problems also seen during the DT/OT. As a result of DT/OT the manufacturer decided to redesign the lower portion of the feed system. That redesign is in progress but it is not completed. We went to the check test with a sort of quick fix old feed system through which many thousands of rounds have been cycled. The manufacturer elected to put a higher torque motor in that feed system. Partially as a result of that and as a result of the wear that had previously been experienced in that feed system and the wear on the rounds of ammunition going through partly, but I don't mean to convey primarily, where there would have been a rather minor jam there were some major problems due to the overdriving of the system.

So we ended up with statistics in that area that are not favorable when compared with the DT/OT statistics. They moved downhill. We are now going through the process of digesting this information looking at the feed system that has been designed and is being fabricated offline and was not tested in the check test and determining what the risks are of going ahead or of pausing to make sure that we have a completely corrected feed system.

In my personal view, we will find the risks to be acceptable. As far as I have gotten into it at this point, I find the risks to be acceptable, but this is not yet the Army institutional position and people above my grade have not yet cast their votes, so to speak. So that is where we stand in this process and we will provide you more information specifically for the record.

Mr. DOTSON. General Maloney, then at this point your feeling would be that there would be a very low probability of slowing down procurement as a result of this test?

General MALONEY. At this point, my own gathering opinion is about 80 or 85 percent complete. But if I were to vote today I would recommend that we continue to march with this program. That is my judgment.

Mr. DOTSON. Thank you, sir.

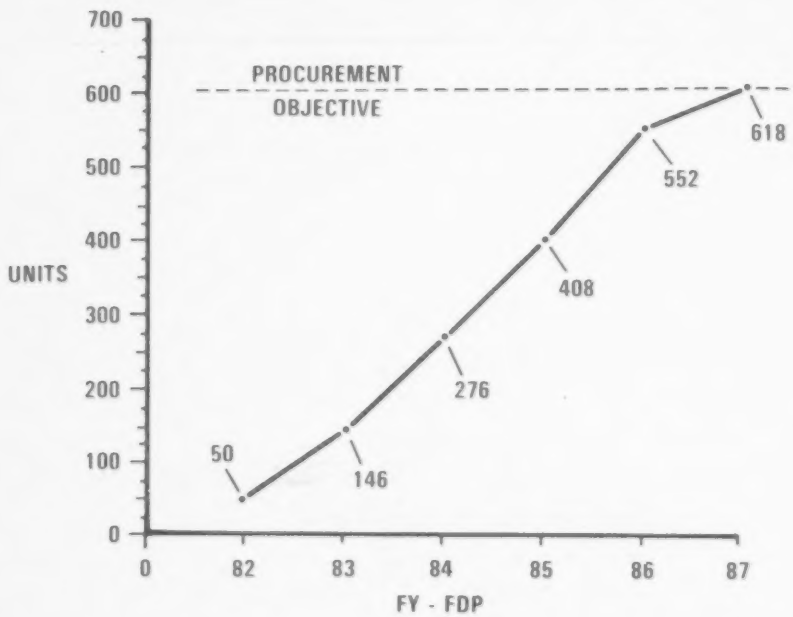
Dr. SCULLEY. ASARC is scheduled for March 12.

DIVAD GUN FISCAL YEAR 1983 BUDGET REQUEST

Provides for: Procurement of 96 gun systems; system spares; completion of R.D.T. & E.; and 239K rounds of ammunition.

General MERRYMAN. This shows what the 1983 dollars buy.

DIVAD PROCUREMENT OBJECTIVE



This shows how we buy out the procurement objective in 1987.

DIVAD GUN - FINANCIAL SUMMARY

PROGRAM UNIT COST
(CONSTANT FY 83 $)

DEV EST FY 78	5.581
FY 82	5.741
FY 83	5.877

COST GROWTH

FY82-83	2%
TOTAL	5%

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E	185.8	29.9	10.9	—	—	226.6
$WPN SYS PROC	138.0	376.2	673.9	747.8	1435.2	3371.1
QUANTITY BUY	—	50	96	130	342	618

$(000,000)

This chart shows we had a 2-percent cost growth during the past year and 5 percent since the program started.

Mr. SMITH. General, let's pause on this chart, if we may. Since the program started you have experienced a total of 5 percent cost growth since 1978.

General MERRYMAN. That is right.

Mr. SMITH. The unit cost in constant 1983 dollars is $5.877 million apiece. That is a program unit cost and it includes all the R. & D., the Milcon, and the works.

General MERRYMAN. That is correct.

Mr. SMITH. How about ammunition, is that in there, too?

General MERRYMAN. I think the only program that ammo is in is the FVS, as I recall.

General MALONEY. I believe it is also in this one, sir.

General MERRYMAN. Is it? OK, let me check. I didn't know that. I had heard the FVS project manager make his pitch so many times and say that he was the only one that I have started to believe it. It does include it.

Mr. SMITH. It does?

General MERRYMAN. It includes R.D.T. & E., procurement, and ammunition.

DIVAD GUN

TOTAL PROGRAM UNIT COST
(DEC 81 SAR)

	BASE YEAR FY78 CONST $ K	FY83 CONST $ K	THEN YEAR $ K
DEVELOPMENT ESTIMATE	3,547	5,581	5,122
CHANGES			
QUANTITY	96	151	103
ECONOMIC	0	0	343
SCHEDULE	0	0	974
ENGINEERING	0	0	0
ESTIMATING	236	371	307
OTHER	0	0	0
SUPPORT	-144	-226	-203
TOTAL (PER UNIT)	3,735	5,877	6,646

The cost growth that you see there results primarily from a requirement for additional ammunition. We didn't increase the number of guns but we did increase the quantity of ammo. That decision resulted in the $151,000 per unit cost growth shown.

Mr. SMITH. General Merryman, another issue that has come up frequently over the past year with the Divad has been the 35-millimeter versus the 40-millimeter gun. Would you explain or tell us how many comparable systems there are in NATO? Are there more 40-millimeter systems as we have on the Divad or are there more 35-millimeter systems in NATO? Where will we find the greatest commonality among existing and protected weapons in NATO?

General MERRYMAN. I can do that. There are more 40's today. As you are aware there are indications that they are moving toward 35's in many of the countries. However, without making the decision to go with the 40's it is sort of the jury-is-still-out situation.

I think to make sure that you get this straight, without me giving it to you in general, let me give you the facts and submit that and lay it out because we have had to answer this so many times that we have the honest factual information and I will provide you that for the record.

Mr. SMITH. Thank you.

[The information follows:]

We determined in the Defense System Acquisition Review Council milestone two review meeting in 1978 that either 40mm or 35mm were interoperable within NATO. The chart shown below depicts the number and location of the NATO 40 mm and 35 mm. The source of the information is the Foreign Science and Technology Center. [Deleted.]

General MERRYMAN. I would like to say at this time that the decision was made based on a decision process that took that into account, you know, whether it should be 35 or 40, and the decision was made fully realizing what the situation was in Europe.

We have one more.

STINGER

Fiscal year 1983—Weapons system procurement request, $214.6 million.
Improved, manportable air defense system.
Fiscal year 1983—6th year of production (basic Stinger); 1st year of production (Stinger Post).
Total buy—46,206.
7,079 procured through fiscal year 1982 FDP.

The Stinger is of course a shoulder-fired missile system. It is to replace the Redeye. I think you are familiar with it. We are asking for money for a sixth year of production for basic Stinger and a first-year production Stinger-Post. We have had a problem with this program. There was a problem in the Post-Seeker development. That means that we will not buy as many Post this year as we had planned and will buy more Stinger this year than we had planned.

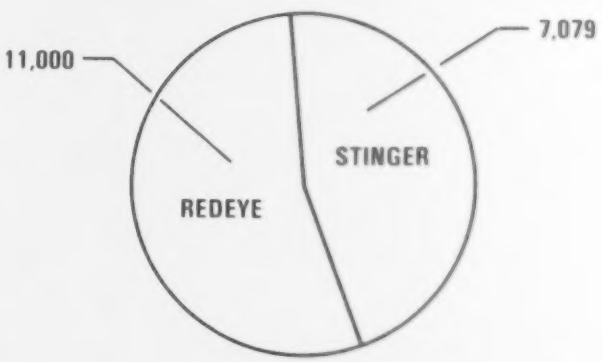
We have found solutions for the problems with Stinger-Post and we are confident now that we can move ahead into Stinger-Post production, but this will mean that overall in the program you will have more pure Stinger than we had originally planned and less Stinger-Post.

We found that out of 10 Post missiles that were fired we had technical problems in 7 of them. As I told you, corrective changes have been made. Changes were necessary to the detector size and to the missile software. We will verify those software corrections during the last two flights this month

Despite the problems that have occurred during flight testing, the new Post Roset Seeker, and that is the Post Seeker, it and the digital signal processor have functioned properly. Government DT/OT flight testing consisting of 16 rounds will begin in April. A production decision is expected in November of 1982. What this did was to extend the Stinger Post program from 44 months to 63 months.

The difference in Stinger and old Redeye, as you probably know, is that [deleted] whereas Stinger can. Also, it couldn't [deleted].

MANPORTABLE AIR DEFENSE ASSETS - END FY 82 FDP



TOTAL ASSETS: 18,709

Mr. DOTSON. General Merryman, in the congressional data sheets you show six firings, two of which were successful. You have just said that you had a total of 10 thus far.

General MERRYMAN. Seven out of ten.

Mr. DOTSON. A total of 10, 3 of which were successful; is that correct?

General MERRYMAN. What I meant to say was that we have had 7 out of 10 that I have a record of that we fired, and I have the record of the 7.

Mr. DOTSON. So the additional three missiles that were fired, one of those was a success

General MERRYMAN. No, no. What I am saying is we have only fired seven is my understanding. We have only fired seven and my record shows four success, two failure, and one no test. Now there were some, what my experts call technical anomalies, in all of these, and I will be glad to give you what I have.

Mr. DOTSON. Could you provide for the record a listing of the actual firings.

General MERRYMAN. Yes.

[The information follows:]

General MERRYMAN. The following is a listing of the seven Stinger-POST contractor firings to date:

Round and objective	Results	Comments (corrective action)
GTV-1: Demonstrate guidance accuracy	Direct hit	Data loss detected during boost phase (detector enlarged from 2 to 3 MRAD to correct problem).
GTV-2: Demonstrate Target Adaptive Guidance (TAG) against full-scale target.	Near miss <1 Ft	Late TAG initiation (adjusted calibration procedures—see GTV-3) GTV-1 problem solved.
DEMONSTRATE SOLUTION TO GTV-1 PROBLEM		
GTV-3: Demonstrate TAG against after burner plume.	Direct hit	Late TAG initiation (adjusted calibration procedures to correct problem).
GTV-4: Demonstrate countermeasure performance against maneuvering target.	No test	Missile ejected from launch tube but rocket motor did not ignite (excessive interference with launch tube snubbers).
GTV-5: Demonstrate TAG against maneuvering full-scale target.	Wide miss	TAG initiated prematurely because of additional IR input from aircraft (changed method of computing (TAG).
ASSESS CORRECTIONS MADE TO TAG		
GTV-6: Demonstrate TAG and countermeasure performance against maneuvering full-scale target.	Ground impact after 1.95 section of guided flight.	Caused by G-sensitive gyro drift term. (Screening of seeker gyro improved).
GTV-7: Plume validation and demonstrate performance against infrared countermeasures.	Direct hit	Low missile roll-rate prior to impact (under investigation).

Mr. DOTSON. This program is not a SAR system as sent over to the Congress. However, I believe that a SAR-type document was prepared for it within the Department of Defense.

General MERRYMAN. That is right. I think there are two systems that the Army requires SAR's on that the Congress does not. I believe this one and one more.

Mr. DOTSON. Do you have for the March 1981 point in time the SAR-type document figure for program acquisition in unit cost?

General MERRYMAN. I don't have it with me, but I can get you whatever information you want.

Mr. DOTSON. All right. Could you provide that for the record as well as the current acquisition unit cost.

General MERRYMAN: Yes.

[The information follows:]

The Stinger program acquisition unit cost from the March 1981 SAR is $72,609 (fiscal year 1983 constant dollars). The current unit cost (December 1981 SAR) in the same constant dollars is $63,274.

Mr. DOTSON. As derived from the congressional data sheets there appears to be about a 30-percent cost increase in program acquisition unit cost over the period of a year. Can you explain that?

General MERRYMAN. Not fully. I know that there has been cost growth in the program. I show a cost growth of about 52 percent between 1972 and 1982. I can send you a SAR extract and that will give it to you in more detail.

Mr. DOTSON. All right, sir, if you would please.

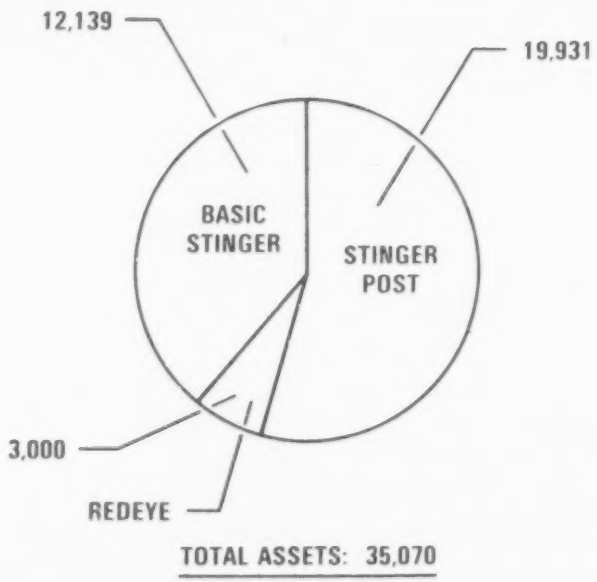
[The information follows:]

General MERRYMAN. As previously stated, the program acquisition unit cost in the March 1981 SAR was $72,609 (fiscal year 1983 constant dollars); the unit cost in the December 1981 SAR was $63,274 (fiscal year 1983 constant dollars). This reflects as 12.8 percent decrease, in constant dollars, since the March 1981 SAR.

Mr. DOTSON. How much of the fiscal year 1983 procurement request for Stinger is for Stinger-Post?

[The information follows:]

MANPORTABLE AIR DEFENSE ASSETS-FY 87



STINGER FISCAL YEAR 1983 BUDGET REQUEST

Provides for:

Procurement of 2212 basic Stinger missiles and initiates procurement of 44 Stinger post missiles.

Mr. DOTSON. Of the acquisition funds requested, what is for Stinger-Post in your program in your total request for 1983?

General MERRYMAN. This is it. The dollar amounts?

Mr. DOTSON. Yes.

General MERRYMAN. I don't know. I don't have that, and I don't have it broken out like that, but I can get you that also.

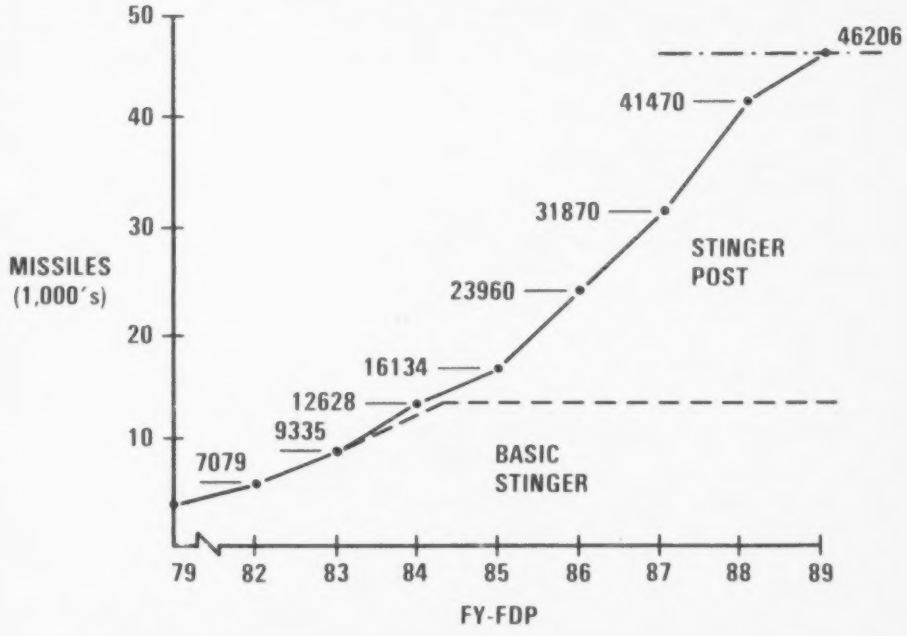
Mr. DOTSON. All right, sir, if you would, please.

[The information follows:]

The fiscal year 1983 Budget for Stinger includes $42.5 million for the initial production of 44 Stinger-post missiles, for proof and testing efforts, and for production tooling and test equipment.

Mr. SMITH. General, I may not have understood what you said earlier. Are you still intending to procure 44 Stinger-Post?

STINGER PROCUREMENT OBJECTIVE



General MERRYMAN. This is the revised program. We had originally intended to procure a higher number.

Mr. SMITH. What was your original number?

General MERRYMAN. I will have to provide that for the record.

[The information follows:]

We originally intended to buy 200 post missiles from the second source. However, the Congress deferred initial post production of 44 missiles from fiscal year 1982 to fiscal year 1983, and we eliminated the second source producer from the program in fiscal year 1983. The fiscal year 1983 Budget was reduced accordingly.

Mr. DOTSON. Does the missile performance in testing to date warrant this kind of purchase in fiscal year 1983 in your opinion, General Merryman?

General MERRYMAN. Yes, we think it does. I think the notes that I will provide you as to what has occurred so that you know what we know. I think that will convince you, too.

Mr. SMITH. Will these missiles be used for additional testing, or will they be used to begin formation of units?

General MERRYMAN. The 44?

Mr. SMITH. Yes, sir.

General MERRYMAN. What I am not sure of is if there is additional testing scheduled after we finish this series of 10 firings. We have fired 7 out of the 10 contractor firings.

Mr. SMITH. That is funded in development I presume.

General MERRYMAN. That is right. Then we have 16 firings that start next month.

Mr. SMITH. Also funded within the development accounts?

General MERRYMAN. That is right. I don't have anything that indicates that there are any plans to fire any of those 44, but here again I had better check before I tell you definitely because I don't know.

[The information follows:]

The 16 round Government flight test program is funded in the fiscal year 1982 R.D.T. & E. account.

Mr. SMITH. Dr. Scully, do you have anything to add to what General Merryman has just said?

Dr. SCULLEY. No, I don't.

General MERRYMAN. Next chart.

This shows the buyout to the procurement objective.

STINGER - FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$RDT&E	200.9	16.1				217.0
$WPN SYS PROC	293.7	193.8	214.6	258.3	2618.2	3578.6
QUANTITY BUY	4535	2544	2256	3293	33578	46206

$(000,000)

This is the financial summary. What I was going to tell you here is that we will go sole source fixed price incentive with lot acceptance. Multiyear is planned for fiscal year 1985 and the cost growth that I mentioned earlier of 52 percent from 1972 to 1982.

Mr. SMITH. How much of that cost growth took place over the past year?

General MERRYMAN. I show from March 1981 to December 1981, a 12.8-percent decrease.

Mr. SMITH. That is all I have. Additional questions have been submitted for the hearing record.

[Questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR BARRY GOLDWATER

Senator GOLDWATER. General Browne, you have stated that the cost of the sight is about $1 million.

What is the cost of the entire TADS/PNVS system? Please include the development and integration costs in your answer.

General BROWNE. The flyaway cost of the Target Acquisition Designation Sight/Pilot Night Vision System (TADS/PNVS) in constant fiscal year 1982 dollars is $1.045 million. The program acquisiton unit cost of the TADS/PNVS, which includes all development and integration, in then-year dollars is $2.732 million.

IFV COST DATA

Senator GOLDWATER. General Merryman, we have learned that the cost of the Infantry Fighting Vehicle has increased this year as a result of rising overhead costs experienced by the manufacturer.

Would you give us a detailed breakdown and justification for these higher overhead charges?

General MERRYMAN. Let me provide that answer in two parts. The first is the projection for fiscal year 1983 and beyond. The outyears are speculative and budgets reflect past experiences projected forward. In the process of awarding contracts, however, we will review overhead with a "hard-eye". Each contractor will be audited and no settlement will be made without overhead being a central focus of negotiations.

The second part is the program experience to date and I can provide some details of the increases there. You may have noted that a long time was spent negotiating the fiscal year 1981 contract. This was mainly due to the increase in overhead which we noted after comparing the proposals from the initial production contract to the second (and later the third year) contracts. The overhead increased approximately 10 percent from fiscal year 1980 to fiscal year 1981 and from fiscal year 1981 to fiscal year 1982. This increase was attributable to a number of factors, the establishment of the Aiken, South Carolina, Parts Plant accounted for almost two-thirds of the increase while the remainder was due to adding an automated manufacturing cost control system, a decrease in the business base and an increase in the overhead rate resulting from a favorable decrease in the number of manufacturing hours. In the case of the Aiken, South Carolina, Parts Plant and the automated manufacturing cost control system, the government conducted a detailed review of the data. The Commanding General, Tank Automatic Command (TASCOM), and I requested FMC's top management to brief us in detail on the Aiken Parts Plant. They did this on two occasions and we agreed to an equitable cost.

In the case of the automated system the government sent a team to FMC to carefully review the cost. Again, we determined what was an equitable cost. In addition, FMC has been required to provide a continuous cost-benefit analysis for review by government officials.

Senator GOLDWATER. Why were these increases not foreseen?

General WHALEN. As I stated above, the costs were foreseen approximately one year ago and have been projected in our request for fiscal year 1983 and beyond.

In fiscal year 1980 the Aiken Parts Plant and the automation were not foreseen by FMC and therefore not projected by the government in our previous requests. We have scrubbed the requirements and found then to be reasonable. FMC's top management had noticed the increase as not being laudable and has taken steps to control overhead costs. We are continuing to pursue overhead control with FMC management.

Senator GOLDWATER. What would be the impact if we didn't fund the increase?

General WHALEN. The impact, I believe, would be a cut in the quantity of vehicles we could procure. The Army has taken into account the limited production experience to date and the results of our negotiated contracts. The budget provides an executable program for the vehicle quantities planned.

Senator GOLDWATER. This year the Army has requested $3.4 million for the initial Research and Development funding of a Lightweight Air Defense System (LADS). What are the Army's intentions in this program? Do you anticipate a missile or a gun system? Will it be a derivative of an off-the-shelf system (preferably one that is currently—or is about to be—in the inventory)?

General MERRYMAN. There is an urgent need to provide improved air defense for our light divisions, and the Army is initiating an accelerated acquisition program to field the Lightweight Air Defense System (LADS) to replace the [deleted] Vulcan. Both gun and missile candidates are being evaluated as LADS.

To insure full understanding of the unique needs of the light divisions, the Army is conducting a Light Divisions Air Defense Force Structure Study, to be completed in late 1982. The study will examine gun, missile, transportability, mobility, survivability, logistic and training requirements and operating concepts, and will ensure we obtain the best possible LADS.

To reduce the cost, time to develop and field and maximize commonality with existing logistic and training support, it is intended that LADS will be a low cost product improvement or derivative of an off-the-shelf system or system programmed to soon be in the active Army inventory.

Senator GOLDWATER. Last year, because of cost growth in the Laser Hellfire program the Army chose not to fund the Fire and Forget Hellfire development. The Senate Armed Services Committee in our fiscal year 1982 Defense Authorization report acknowledged that decision and stated that we expected the Army to continue to explore methods of obtaining the fire and forget capability.

What has the Army done in the past year to obtain the fire and forget capability?

General BROWNE. In February 1981 an Army In-Process Review met to consider initiation of engineering development (ED) for the Hellfire Fire and Forget Seeker (HFFS). The Army determined that imaging-infrared (IIR) HFFS benefits were not significant enough in complementing the Advanced Attack Helicopter/Target Acquisition Designation System and laser Hellfire to justify initiating ED with high program costs and risks. It was determined that HFFS had technical concerns needing analysis, including missile rollrate, boresight correlator, seeker/missile/aircraft integration complexities, simulations/analyses, and focal plane array technology. The development cost estimate was between $500 million and $700 million with an estimated initial operational capability in fiscal year 1990.

The Army Missile Command is implementing a Fire and Forget seeker plan that begins in fiscal year 1982 with a joint Army/Air Force IIR seeker definition and technology demonstration. A technology development/advanced development program has been outlined that could transition into engineering development in fiscal year 1987.

The joint IIR program is a 6.2 effort (PE 6.2303A214) funded at $4 million for fiscal year 1982 and 1983. The requests for proposal were issued on 11 March 82 and responses are expected by April 26, 1982 from about eight contractors. Up to four $1 million contracts are expected to be let on July 16, 1982.

Senator GOLDWATER. The Army Helicopter Improvement Program (AHIP) has been rising steadily in cost.

One year ago the cost estimates were:

	Millions
R.D.T. & E.	$168
Procurement	1,558
Total for 720 aircraft	1,726

Your current estimate shows costs of:

	Millions
R.D.T. & E.	$228.1
Procurement	$2,303.5
Total for 578 aircraft	2,531.6

The cost has gone up significantly while the number of aircraft to be procured ha dropped from 720 to 578.

How do you account for this dramatic increase in cost?

General MERRYMAN. The estimates quoted in the question above for the Army Helicopter Improvement Program (AHIP) research, development, test and evaluation (RDTE) and procurement costs are preliminary cost estimates developed in August 1980 time frame for a generic AHIP. Configuration changes approved by the July 1980 Army Systems Acquisition Review Council (ASARC) and further definitization of program costs during the source selection process (April 81-September 81) resulted in additional RDTE funding requirements. The increase from $168.8 million to $228.1 million was required for the following reasons:

(a) The current AHIP engine is different from that originally considered in the generic AHIP.

(b) The current design requires upgrading of the drive train and modernization of other airframe and subsystem components that were not costed in the generic AHIP.

(c) The procurement of additional mission equipment subsystems (i.e. two Mast Mounted Sights (MMS) and two Cockpit Data Systems (CDS)) to reduce risk in the full scale engineering development (FSED) program.

(d) Technical publications, manuals and revisions were changed to the Skill Performance Aids (SPA) format.

(e) The contractor program management requirement increased due to the fact that total system responsibility was given to a single prime contractor.

(f) There were minor changes to the R.D.T. & E. escalated dollar profile which can be traced to changes in guidance issued by the Office, Secretary of Defense (OSD) for inflation indices.

In regards to the procurement change from $1,558 million to $2,303 million, the original estimates were based on a smooth, rapid build up to a projected delivery rate of 14 aircraft per month during the second year of production delivery. Overall Army funding constraints required stretching the AHIP procurement profile and extending the build up to reach maximum rate in the fourth production year. The inflated dollar estimate for the stretched program was $2,081 million for 720 aircraft. At this point, cost estimates were still based on a generic AHIP. This estimate was completed in March 1981 and was the best government estimate available prior to the start of the source selection process for full scale engineering development in April 1981. Changes to the inflation guidance and indices have resulted in several additional perturbations in procurement cost estimates—from $2,081 million to $2,051 million to $2,303 million in escalated dollars—each of which can be traced to the current $1,326 million fiscal year 1981 constant dollar estimate.

During the source selection process, government estimates of unit production costs were increased as a result of better aircraft configuration definition and incorporation of the improvements mentioned previously as contributors to the R.D.T. & E. increase. Furthermore, the Army made a decision near the end of the source selection process that AHIP procurement funding would be constrained to that which was already programmed, i.e. $1,326 million in Fiscal Year 1981 constant dollars. This decision coupled with the increased government estimate of unit cost required a reduction in the procurement objective from 720 to 578 aircraft. The planned procurement objective of 578 aircraft still fills all scout requirements in units to be equipped with AH-64's, and also satisfies the most critical AH-1S and Field Artillery Aerial Observer (FAAO) requirements.

In summary, there has been one major increase in R.D.T. & E. cost due to changes in scope of the program, one increase in the procurement dollar requirement due to program stretch, and one decrease in aircraft quantity caused by increased government unit cost estimates of the AHIP. However, the real dollar increase in total program cost over the past year has not been dramatic. In March 1981, the total program cost was estimated to be $2,249 million and in March 1982 the total program cost was $2,531 million, an increase of 12.5 per cent. This increase includes the RDTE scope change and all changes due to inflation. It should be noted that AHIP budgets are predicated on in-house most likely estimates for the production program, not on the lower contractor projections.

Questions Submitted by Senator Strom Thurmond

EQUIPMENT FOR ARMY RESERVE AND NATIONAL GUARD

Senator Thurmond. General Merryman, you stated that equipment for the Guard is included in the request for the active Army and there is no separate equipment request for the Guard and Reserve in the fiscal year 1983 budget?

General Merryman. That is correct. There is not a separate line in the fiscal year 1983 Budget requesting equipment for the Guard and Reserve forces. The Army procurement program, as presented, is based on equipment requirements for both active and Reserve Component units. Distribution of this equipment to both active and Reserve Component units is made 2 to 3 years after the funds have been allocated by Congress.

MINELAYING

Senator Thurmond. General Menetrey, what capabilities exist for laying minefields rapidly to channel Soviet forces?

General Menetrey. There are five rapid minelaying systems either in the force, entering the force, or scheduled to be fielded during the POM years.

(a) The M-56 Mine System is a helicopter mounted dispensing system capable of delivering 160 mines effective against armor, wheeled or tracked vehicles and personnel. This system has been issued to US Army Europe Only.

(b) The Area Denial Artillery Munition (ADAM) is an artillery delivered antipersonnel mine. A single 155mm artillery shell delivers 36 mines to re-seed existing mine fields, to close lanes and gaps in minefields or deliver mines on an opposing force. This system is being fielded during fiscal year 1982.

(c) The Remote Antiarmor Mine (RAAM) is an artillery delivered magnetically fuzed antiarmor mine. A single 155mm artillery shell delivers 9 mines to close gaps and lanes in minefields, re-seed existing fields or to block a maneuvering enemy force. This system is being fielded during fiscal year 1982.

(d) The Ground Emplaced Mine Scattering System (GEMSS) is designed to emplace large pre-planned minefields. The M128 dispenser scatters 800 antiarmor and antipersonnel mines per load. This system will be fielded during fiscal year 1984.

(e) The Modular Pack Mine System (MOPMS) is a man portable system designed for selective protection and small area coverage. MOPMS modules consist of a box with a remote firing device and 21 mines. The mines are explosively dispensed from the box only if enemy contact is imminent. If there is no need to dispense the mines from the module the system can be retrieved for later use. The system contains both antiarmor and antipersonnel mines. This system is expected to be fielded during fiscal year 1986.

REAR AREA MINEFIELDS

Senator THURMOND. General Menetrey, what capability exists, if any, to lay minefields in the enemy's rear area to slow or channel the "second echelon"?

General MENETREY. There is a joint service system known as GATOR for which the Air Force has overall system responsibility. GATOR allows the ground commander to deliver mines on the enemy second echelon and attack both the lead elements and second echelon simultaneously. A single aircraft sortie can deliver approximately 600 Gator mines. Gator is about to enter production and is expected to be [deleted].

WOMEN IN SUPPORT BATTALIONS

Senator THURMOND. General Menetrey you outlined a doctrine of "fix forward," requiring support battalions to move and fix equipment in the forward areas. How many women are in these support battalions and how will that effect your doctrine in view of the fact that it is the policy of this country not to send women into combat?

General MENETREY. Unlike the Navy and the Air Force who are bound by the statutory restrictions contained in sections 6015 and 8544 of title 10, United States Code, the Army has no such statutory restriction on the utilization of its female soldiers. The Army operates under a combat Exclusion Policy issued by the Secretary of the Army.

This policy precludes women from assignment to battalion or squadron size and smaller size units of Infantry, Cannon Field Artillery, Armor, Combat Engineer, and Low Altitude Air Defense Artillery. This means that the combat support and combat service support units, which provide support directly to these combat arms units, are open to women. Consequently, women serve through the battlefield.

The female density in the Army's general maintenance career management field is about 3 percent or 2,268 of 66,412, while the female content of the aviation maintenance career management field is about 2 percent or 479 of 21,263. Additionally, the Army is increasing organizational level capability for its new weapons systems. This means that more maintenance personnel will be assigned at the combat battalion level or below. Since women are precluded from serving at this level, the Army must continue to utilize its female soldiers at the next echelon of maintenance support.

UNCONVENTIONAL WARFARE ASSETS

Senator THURMOND. General Menetrey, you stated that terrorism and unconventional warfare are the two most probable forms of conflict. What is the current status of U.S. unconventional warfare assets?

General MENETREY. Within the Army force structure, we have three Special Forces Groups in the Active Army and four Groups in the Reserve. Each group is capable of conducting unconventional warfare.

MODERNIZING UNCONVENTIONAL WARFARE ASSETS

Senator THURMOND. General Menetrey, the Army is committed to modernization and expansion in the out years. In light of the higher threat from terrorism or unconventional warfare what are the plans for modernizing these forces?

General MENETREY. The Army is continually reviewing its force structure. Currently, a special review is being conducted of its Special Operation Forces. This review will be finished by mid-June, it will reveal what steps are necessary for an expansion or modernization of the force.

CREW SURVIVABILITY IN NBC

Senator THURMOND. General Menetrey, I understand that Soviet tanks and personnel carriers are sealed to provide protection against NBC attack. Our equipment is not. I also understand that our protective clothing loses its protective capability as the soldiers perspire heavily. The M-1 tank is reported to be exceedingly hot inside which will cause soldiers to perspire heavily. What impact will this have on tank crew survivability in the NBC environment?

General MENETREY. The current production model of the M-1 Tank includes a ventilated facepiece that provides respiratory protection for each crew member when in an NBC contaminated environment. However, some chemical and biological agents act by contact through the skin and, as a consequence, the M-1 crew is still required to wear individual protective clothing which introduces significant heat load—resulting in degradation of mission performance. As a result of this deficiency, a product improvement (Hybrid Collective Protection) is scheduled for the M1E1 in fiscal year 1985. The improvement will add positive overpressure and microclimate cooling. Positive overpressure will allow the crew to remove their individual protective clothing and equipment when the tank is buttoned up—hatches closed. When operating with hatches open, positive overpressure will minimize contamination entering the vehicle, and thus, minimize the decontamination problem of both the vehicle and crew. Microclimate cooling will minimize heat stress with hatches open or closed—insuring the crew's combat effectiveness.

U.S. ARMY IN NATO COMPETITIONS

Senator THURMOND. General Menetrey, Senator Hollings recently appeared before the Subcommittee on Manpower and Personnel. He expressed concern about the quality of personnel in the Army. He stated that in 1977 a select U.S. tank crew finished sixth out of six participants in tank gunnery competition in Europe. In 1979 the United States finished fourth out of five participants. How do U.S. soldiers fare in the various forms of competition with our NATO allies?

General MENETREY. The U.S. Army did quite well in 1981 military competitions. In fact, there has been a dramatic improvement in Army results since 1979 as depicted below. Note that U.S. teams placed first in only one competition in 1979—the parachute competition. In 1980 some improvement was made, but in 1981 the U.S. Army won six of seven competitions and improved its standing in the Canadian Trophy Tank Competition.

	1979	1980	1981
International Military Sports Council (marksmanship)	2d	2d	1st.
Interallied Confederation of Reserve Officers (swimming, marksmanship)	4th	2d	1st.
International Minuteman Competition (marksmanship)	5th	16th	1st.
Canadian Trophy[1] (NATO Tank Gunnery)	4th		3d.
Boeselager (armored cavalry competition)	9th	2d	1st.
Helicopter[2]			1st.
International Military Sports Council (parachuting)	1st	1st	1st.

[1] Conducted every other year.
[2] Did not participate in 1979 and 1980.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

Senator LEVIN. As you may be aware, last year I offered an amendment to the fiscal year 1982 authorization bill that would require the Defense Department to publish its intent to negotiate a sole-course contract 30 days in advance of those negotiations so that prospective bidders could respond to the notice. The amendment

failed in conference, but I have offered a similar provision as an independent bill this year (S. 1901).

The bill does not necessarily require the Department to open up the proposed procurement to competition, but does give the Department an alternative for that or future procurements if other parties respond. In that way new competitive alternatives could be explored. I should note that the bill also provides for exceptions to that notice for legitimate instances in which it would be appropriate to proceed on a sole source basis without public notice such as on classified procurements.

In view of the Carlucci initiatives, one of which is emphasizing increased use of competition in procurement, would you be supportive of this type legislation? If not, why not? Has the Army established any numerical goals for increasing the use of competition (such goals have been suggested the Congress and the GAO? If not, why not?). Would it be difficult to establish a specific numerical target for increasing the use of competition? If so, doesn't the approach that I just described, that of allowing potential alternative bidders to respond to public notices seem to be more appropriate for increasing competition without tying your hands on specific targets?

Dr. SCULLY. The attainment of more effective competition is one of the major challenges facing us today. The Army has developed management objectives for the enhancement of competition. I believe these actions clearly demonstrate our commitment to both enhance and achieve more effective competition in the acquisition process. I also believe that the system in place is clearly adequate to effectively monitor the process and provide information desired by Congress on competition. I do not feel that legislation such as Section 908 of the Senate Authorization bill for 1982 that would require a 30-day advance publicizing of proposed procurements would be beneficial. We are now required to synopsize proposed procurements in the Commerce Business Daily 10 days before the issuance of solicitations. Enactment of Section 908 would add another administrative requirement. I do not recommend legislation along the lines contemplated by Section 908. Rather, we should continue to improve our existing procurement techniques which show the greatest promise to effectively enhance competition. Goals for increasing contract competition have been established by all Army contracting activities. They are tailored to the specific procurement missions for that activity and progress reports will be provided to me quarterly. I will monitor these efforts very closely. I feel it would be quite difficult for Congress, OSD, or DA to establish specific numerical targets for increasing the use of competition. Unqualified emphasis on price competition alone could prove to be shortsighted. We seek a balanced approach that recognizes all the attributes of competition, of which cost savings are only one. Our current procedures emphasize competition in quality, reliability, maintainability, concept, design, or the use of alternate materials and components. We will continue to seek the benefits of effective competition throughout the acquisition process.

SECOND SOURCING

Senator LEVIN. In devising an acquisition strategy, is a program manager of a major program in the Army required to make an analysis of the cost and benefits of dual sourcing? Is there any Army policy document that requires such an analysis to be performed? When is such an analysis performed? What is the process of review of such an analysis?

ANSWER. There are no Army regulations or policy documents which require dual sourcing to be undertaken by a project manager. The driving force behind dual sourcing is not cost benefit through competition but rather provision of an adequate mobilization base. Dual source procurement is negotiated under authority of 10 USC 2304(a)(16), the exception for mobilization purposes. As such, it is not based on any formal cost-benefit analysis.

Senator LEVIN. What Army programs have used dual sourcing? What were the reasons dual sourcing was used in each case? What were the results of dual sourcing in terms of cost savings and quality improvement in each case?

ANSWER. Using fiscal year 1981 as a typical example, there were 408 actions under Exception 16 (Mobilization), Equating to $929 million. Many of these actions provided for dual production sources. Most of these actions were for ammunition or ammo-related items. These actions did not necessarily lead to cost savings or quality improvement; in some instances a cost premium was paid in order to maintain a mobilization production capability.

Senator LEVIN. What is the Army policy on dual sourcing of subcontractors for major subcomponents? Does the Army direct that major subcomponents be produced by dual source? What caused the dual source situation between Hughes and Kills-

man on tank fire control systems to occur? What were the results of that instance of dual sourcing?

ANSWER. The Army encourages dual sourcing, when it is economically feasible, in order to broaden the mobilization base. It does not have a formal policy on dual sourcing of subcontractors. However, it may direct dual sourcing in cases where it is needed to ensure an adequate mobilization base. The dual source situation involving Hughes and Killsman was necessary to support both the M60 A1 to A3 conversion program and the M60 A3 new production line. In 1981 a competitive (three-year) multi-year procurement was initiated between Hughes Aircraft Company (HAC) and Killsman Instrument Company (KIC) for solid state computers (SSC) and Laser rangefinders (LRF), KIC won the competition in December 1981, at a price approximately 30 percent below their previous price. The Project Manager for the M60 program estimates first year savings at $14.4 million and potential savings (without exercising options for higher quantity deliveries) at $49.3 million over the life of the contract.

Senator LEVIN. What determines when the Army will allow the prime contractor to establish his own group of subcontractors, as opposed to the Army choosing subcontractors for major components?

ANSWER. Generally the prime contractor selects his own subcontractors for system components. However, on occasion, where there are major components that have been previously developed and are technically compatible with the new systems, the Army may specify a subcontractor in order to reduce the development cost. As the system matures, these items may be broken out and supplied as government furnished equipment.

BRADLEY FIGHTING VEHICLE COST

Senator LEVIN. What is the unit cost of the Bradley Fighting Vehicle to that of the M-113 personnel carrier?

General MERRYMAN. It is difficult to compare the unit costs of the Bradley Fighting Vehicle and the M113 not only because the capabilities and missions of the two vehicles are so different, but also because the M113 has been in production for over 20 years. This means that the M113 tooling, production testing, research and development, spares and management costs have long ago been absorbed and are insignificant when it comes to unit costs. This is not the case for the Bradley, which has only been in production since 1980.

Based on our fiscal year 1983 procurement request the unit cost of the M113A2 would be $176,900 for 520 vehicles. The rollaway unit cost, a somewhat similar comparison, for the Bradley Fighting Vehicle would be $1,110,000 in fiscal year 1983 constant dollars. I must emphasize that the Bradley unit cost includes tooling, testing and project management. I also must reemphasize that the cost of the M113A2 buys you a carrier with a .50 caliber machinegun—not a fighting vehicle with a stabilized 25mm cannon, TOW missile system, thermal night sight, firing port weapons, exceptional cross-country mobility and four times the armor protection of the M113A2.

M113 FIGHTING VEHICLE

Senator LEVIN. Is there a fighting vehicle variant of the M113? What is its unit cost? What level of armor protection does it have relative to the Bradley vehicle? What kind of armament does this fighting vehicle variant of the M112 have?

General MERRYMAN. There are several M113 variants, designed for foreign military sales. The version most often cited in this category is the Armored Infantry Fighting Vehicle (AIFV). The AIFV was sold to the Dutch, and as configured for that sale would cost approximately $448,700 (fiscal year 1983 rollaway cost). To add the improvements required to meet the operational requirement would drive the cost of the AIFV to almost $1M without considering costs for integrated logistics support, training, test equipment, spares, and other costs of fielding a new system. The AIFV would take at least five years to reach troop units.

The AIFV armor protection is better than the armor of the M113. It has aluminum armor which will generally defeat projectiles up to the 14.5mm machine gun. It has no belly armor for mine protection. The Bradley has belly armor, will defeat the 14.5mm machine gun, has survived 155mm artillery air bursts directly overhead, and is considerably more survivable due to improved acceleration, mobility, and ability to provide accurate, effective suppressant fire while moving.

The AIFV has an unstabilized one-man turret mounting, a 25mm gun and a 7.62mm machine gun. It has five firing ports. The Bradley has a stabilized two-man turret with the 25mm gun and a coaxial 7.62mm MG, six firing ports, and a two

tube pre-loaded TOW antitank guided missile launcher. As target acquisition is as important as firepower, it shoud be pointed out that the AIFV has only a passive infra-red sight. The IFV has thermal imaging, which makes it much more effective at night and during poor visibility conditions.

BFV COST EFFECTIVENESS

Senator LEVIN. With the Bradley vehicle being about four times the cost of the fighting vehicle based on the M113 design, is the Bradley vehicle most cost effective?

General MERRYMAN. Yes, because:

(a) The Bradley meets mission requirements and the M113 design (the AIFV) does not. There is not cost effectiveness whatever in buying something that will not accomplish the mission.

(b) Multiple indepth analyses (IFV/CFV Cost Effectiveness Analysis, the IFV Task Force, IFV/CFV Special Study Group, Cost Effectiveness Update, and others) have unanimously concluded that the most cost effective approach to meet mission requirements is the IFV/CFV.

The cost of the IFV is not four times the AIFV, not three times the AIFV, and not two times the AIFV. To meet the mission the AIFV would require a stabilized turret, thermal imaging, and an antitank guided missile system. The cost to produce the improved vehicle would be approximately $800,000 and the AIFV would not have a smoke grenade launcher, belly armor, or the mobility and reliability performance of the IFV. Adding these features would drive the AIFV cost above that of the IFV, assuming that it is even possible to achieve comparable performance in the AIFV.

M113 ALTERNATIVE

Senator LEVIN. Why shouldn't we procure improved M-113's—with upgraded armor and firepower—as an alternative to the Bradley Fighting Vehicle?

General MERRYMAN. The M113 has been in production over 20 years and could not be improved effectively, in terms of time and cost, to provide comparable capabilities of the Bradley Fighting Vehicle. A total redesign of the hull, drive train, and suspension would be required to withstand the additional weight of a Bradley-type turrent without compromising crew protection and vehicle mobility. This major M113 redesign and development effort would take an estimated five years to accomplish, thereby further delaying the fielding of an infantry/cavalry fighting vehicle capability.

Procurement cost estimates for an improved M113 alternative with upgraded armor and firepower have not been developed. However, it is likely in the long run that these costs would exceed that of the Bradley, due to the major M113 redesign required than the effects of inflation.

Senator LEVIN. What evidence can you provide now, and for the record, as to why the Bradley fighting vehicle is more cost effective than any upgraded M113?

ANSWER. If an upgraded M113 was more cost effective than the IFV, the Army would have upgraded the M113 and not developed the IFV.

No upgraded M113 has been designed that can meet the mobility, survivability, firepower, and reliability performance levels deemed essential for the modern battlefield. If the assumption is made that an M113 could be upgraded to the point that it meets these specifications, the following is true:

(a) It would have a completely redesigned suspension to increase road wheel travel and accommodate heavier loads due to other additions.

(b) It would have completely new power train to provide adequate power and exceleration.

(c) It would have completely new fire control and turrent control systems to accommodate new weapons and sights.

(d) It would have a completely new top deck arrangement to accommodate the turrent and anti-tank guided missile system.

(e) It would have a new flooring configuration to accommodate adequate belly armor against mines.

(f) Internal stowage and seating would be reconfigured.

(g) The fire extinguishing system would have to be redesigned along with a redesigned fuel system.

(h) A smoke grenade launcher would have to be added.

(i) The upgraded M113 would have to be extensively tested to determine its mobility, vulnerability, reliability, air transportability, and many other design criteria.

(j) All test equipment, manuals, and training devices would need to be redesigned or modified.

(k) An integrated logistics support package would need to be developed.

(l) A large tooling cost would be incurred due to these modifications.

(m) Modifications would take up to five years, with no guarantee of success. The overall cost would probably be higher than the cost of the IFV.

The IFV has completed development and operational testing, meets the Army's need, and its completing its final steps leading to fielding. There is no doubt that the IFV is the most cost effective approach to meeting Army requirements.

Senator LEVIN. Why has the Army decided to increase the numbr of launchers and missiles per fire unit of Patriot?

General BUNYARD. In 1965, the projected number of Warsaw Pact aircraft expected to be encountered by the NATO Air Defense was such that only twelve missiles were planned for the Patriot fire unit. By 1972, the threat projected in 1965 was recognized as being underestimated and the number of missiles per fire unit was increased to 20.

Recent increases in the threat, which include low altitude attack profiles, increased electronic countermeasures, and cooridor busting techniques were addressed during Air defense studies conducted in 1979 and 1980. These studies conclude that the programmed Patriot force be equipped with 32 ready missiles per fire unit (up from 20) and 8 launchers per fire unit (up from 5). This increase in fire power requires an additional 265 launchers and 1944 missiles in order to maximize defense effectiveness.

Senator LEVIN. In previous years the Patriot system experienced technical problems in testing. Performance of the fire control system and the missile was such that additional development and testing was required by the Secretary of Defense. Has the Patriot demonstrated the performance required by the Secretary of Defense at this point in the program of additional testing? What remains to be demonstrated to complete the improvements in Patriot performance required by the Secretary of Defense to be demonstrated in testing?

General BUNYARD. The results of the first three units of confirmation testing conducted in fiscal year 1981 have been evaluated by OSD and have met or exceed the established goals in all areas except maintainability. Based on these test results, the production rate was increased in 1982 from 5 to 9 fire units and the system was certified ready to move on to the operational testing of first production hardware.

The maintainability problem centers around the ability of the Patriot diagnostic software to isolate failed system modules after they have been detected by the status monitor. An intensive development program to mature the system status monitor and diagnostic software capability has been approved by the Office of the Secretary of Defense and has been implemented. Maintainability will be tested as part of the fiscal year 1983 follow-on evaluation which is the fourth unit of testing specified by OSD.

Senator LEVIN. The Patriot has been in procurement for at least the past two fiscal years. Since most procurement contracts are fixed-price type, why is the Army planning to award a cost-plus incentive fee type contract for fiscal year 1983 and fiscal year 1982?

General BUNYARD. The Patriot Defense Systems Acquisition Review Council in August 1980 authorized limited production, and specified four units of verification tests and a fund release mechanism that the Army would use for contracting. The release of funds was to be based on successful completion of testing. This decision allowed production to start while known hardware and software fixes were incorporated in the system and tested. These tests will be completed in fiscal year 1983.

With the program structured in this manner, the delivery of a technical data package (TDP) to the Government upon which a fixed-price contract could be based was delayed. The current schedule is for the Government to take control of the TDP in late 1982 or early 1983. This will be too late to propose, evaluate, negotiate and award a fixed-price contract for Patriot in fiscal year 1982 or fiscal year 1983. It is anticipated that fixed-price contracts will be used for Patriot starting in fiscal year 1984 and beyond.

Senator LEVIN. How many systems in procurement in fiscal year 1983 does the Army intend to procure under cost-plus contracts? What are they and why?

ANSWER. Of the major systems in procurement in fiscal year 1983, current indications are that only two are potential candidates for cost-plus type contracts. In order to provide for the rapid fielding of Patriot and Pershing II, the Army is pursuing concurrent production and testing of these systems. The Army's goal is to negotiate fixed-price type contracts for both of these systems. However, the concurrency may result in production uncertainties that will preclude achieving this goal.

M113 AND M577

Senator LEVIN. The fiscal year 1983 authorization request for Army procurement shows 520 M113 and 114 M577 vehicles that were not forcast for procurement last year. Why are these vehicles being requested for fiscal year 1983? Are these high priority purchases?

General MERRYMAN. The M113 remains in critically short supply. Assets throughout this decade will be significantly below requirements despite introduction of Bradley fighting vehicles into inventory. Restraint on procurement, the fact that none were requested in fiscal year 1982 and the very limited quantity requested for fiscal year 1983, has been driven almost entirely on the basis of affordability within constrained budgets. The vehicles are being requested in fiscal year 1983 because they are needed and because without a procurement of these vehicles in fiscal year 1983 it is probable that the production base will close down irreversibly.

Assets of the M577A2 Command Post vehicle are also well below requirements and the carriers requested in fiscal year 1983 are needed specifically for the Multiple Launch Rocket System (MLRS) as the fire direction center. There was a limited procurement of 27 of these carriers authorized for the National Guard in fiscal year 1982 as an intiative of the Congress.

Purchase of both of these vehicles is considered to be a matter of high priority.

M113 PURCHASE

Senator LEVIN. Why should we buy additional M113 armored personnel carriers—vastly inferior the new Bradley Fighting Vehicle if we are spending millions to procure 600 Bradley Fighting Vehicles in fiscal year 1983?

General MERRYMAN. The M113 family of vehicles will continue to serve many critical roles even as it is being supplanted in some of its roles by the Bradley Fighting Vehicle. Qualitatively, the two vehicles are not comparable. The Bradley adds a new and vital capability that the M113 was never intended to possess and, as a practical matter, cannot be made to possess. The Bradley, for these reasons, also costs several times as much as the M113.

We have a situation in which the M113, one of the most outstanding combat vehicles ever built, cannot survive on the modern battlefield as a fighting vehicle. On the other hand there are numerous roles, not requiring head-to-head confrontation with hostile fighting vehicles, for which the M113 will continue to give outstanding performance, and for which the Bradley Fighting Vehicle is not affordable. In brief, there is a compelling need for both vehicles. The most pressing current neeed for the M113 is to enable the Army to provide chassis for Improved TOW Vehicle (ITV) and Fire Integration Support Team Vehicle (FISTV) production.

AH-64

Senator LEVIN. Since the hearing on the AH-64 on February 4, has the Army examined the cost effectiveness of the AH-64 and variants of the AH-1 armed with the Hellfire missile? What are the results of this examination? What is the cost of the variants relative to that of the AH-64 and AH-1 variants? What accounts for the relative cost effectiveness rankings?

General BROWNE. The AH-1 armed with Hellfire, would require major redesign of the airframe and drive train, and the inclusion of a four blade rotor system, two engines, and Target Acquisition Designation Sight/Pilot Night Vision System, in order to be an effective alternative to the AH-64. That redesign and test effort would take 4 years and cost approximately $637 million. The result would be a AH-1 that would cost $14.5 million versus $13.2 million for the AH-64 (average unit procurement cost, then year dollars) because of a later procurement. The AH-1 could be comparable in effectiveness to the AH-64, but would be more vulnerable and less survivable.

Senator LEVIN. Will the Army be able to procure 11 AH-64 helicopters in fiscal year 1982 for the amount budgeted?

General BROWNE. Yes.

UH-60

Senator LEVIN. The Army plans to request a multi-year procurement program for the UH-60 to begin in fiscal year 1982 through a reprogramming request. Are costs of the UH-60 stable enough to qualify this program for multi-year procurement, especially after the large increase needed in the original fiscal year 1982 bill to maintain the planned buys?

General MERRYMAN. While there was a substantial increase in the original fiscal year 1982 budget, a large percentage of this growth was to procure 96 aircraft as opposed to the 78 aircraft in the original plan. Later during the fiscal year 1982 budget hearings, the program was decremented $25.1 million. Because of continuing cost management improvements, it was possible to absorb this decrement and still procure the 96 aircraft.

Program costs for the UH-60 Black Hawk program are now stable. The fiscal year 1981 contract price for 85 airframes (5 USAF) has recently been reduced by $15 million, the result of substantially improved cost and production management at Sikorsky. Even with this reduction in ceiling price, it is anticipated that the contractor will complete the contract well within the new ceiling.

The improved cost and production management at Sikorsky were substantiated twice in fiscal year 1981 by "should cost" efforts conducted by the Army. As a result of these visits and Sikorsky's willingness to sign a firm fixed price contract for a fiscal year 1982-1984 multiyear contract, the Army is convinced that Black Hawk costs are under control. The UH-60A program meets all of the criteria for multiyear procurement.

Senator LEVIN. If the request for multi-year procurement in fiscal year 1982 is made, how will the Army restructure the financing of the program to provide sufficient advance procurement funds in fiscal year 1982?

General MERRYMAN. The proposed fiscal year 1982-1984 Black Hawk airframe multiyear procurement will require a reprograming action moving funds within the program and transferring additional funding into the program from an external source. Specifically, $35.5 million will be moved from the Black Hawk procurement line to the Black Hawk advance procurement line and $34.9 million transferred from another source into the Black Hawk advance procurement line. This reprograming when combined with the already appropriated advance procurement funds will provide the necessary advance procurement funding in fiscal year 1982 to execute the fiscal year 1982-1984 multiyear contract.

Senator LEVIN. What is the forceout for UH-60 procurement cost by fiscal year for each year of the proposed multi-year contract?

General MERRYMAN. Approval of the fiscal year 1982-1984 multiyear procurement requires a reprogramming of funds into the Black Hawk program in fiscal year 1982 and forces out funding in fiscal year 1983 and fiscal year 1984. The changes to the profile are reflected on this chart:

[In millions of dollars]

	Fiscal year—		
	1982	1983	1984
Procurement	−35.5	−85.6	−46.8
Advance procurement	+70.4	−61.7	−62.9
Force out	+34.9	−147.3	−109.7

There is an additional force out from the Quick Fix program as a result of the fiscal year 1982-1984 multiyear program. This is because the Quick Fix utilizes the Black Hawk airframe and for that reason is part of the multiyear procurement:

[In millions of dollars]

	Fiscal year—		
	1982	1983	1984
Procurement			−8.0
Advance procurement		−7.9	−13.8
Force out		−7.9	−21.8

In summary, the total increase to the programs as a result of approval of the fiscal year 1982—fiscal year 1984 multiyear proposal is the addition of $34.9 million

in fiscal year 1982 and the freeing up of $155.2 million in fiscal year 1983. The fiscal year 1984 changes will be adjusted during the Army budget building process.

M60 TANK PROGRAM

Senator LEVIN. What is the capacity for modifications of M-60A1 tanks to the M-60A-3 configuraton? How many modifications are supported in the Army's procurement program each year for fiscal year 1983/fiscal year 1987?

General MALONEY. The maximum rate for the M-60A1 to A3 conversion program is 1,200 per year based on facility limitations. The total is made up of 1,050 conversions per year at Anniston Army Depot in Anniston, Alabama, and 150 per year at Mainz Army Depot in the Federal Republic of Germany. There are additional considerations that must be factored into a decision to use the capacities I have mentioned. First, filling up a "pipeline" with tanks to get up to a 1,200 conversion per year rate would have an adverse readiness impact by drawing down fielded tank assets until a one-for-one replacement (an A3 for an A1) situation could be achieved. Second, a successful ramp to the maximum conversion rate is based on Kollsman Instrument Company (KIC) and Hughes Aircraft Company (HAC) achieving 720 and 480 Laser Rangefinder and Solid-State Computer sets per year each, respectively. HAC participation is contingent on their interest in being involved in view of the recent winner-take-all fiscal year 1982-84 multiyear contract award to KIC. HAC would experience a six-month break in production if they were to participate. This could result in paying premium prices to procure the 480 conversion sets above the 720 that KIC can produce. The recent winner-take-all award to KIC for elements of the M-60A3 fire control system resulted in significant price reductions and consequently the fiscal year 1983 conversion funds will get the Army 453 conversions. For fiscal year 1984-87, programed funds will get the Army 460 conversions per year, but is subject to adjustment based on the structuring of the Army's fiscal year 1984-88 program and a reevaluation of overall Army priorities.

M60 MODIFICATION

Senator LEVIN. How could the number of annual modifications be increased while minimizing the impact on readiness of units equipped with the M-60A1? What would this cost through the fiscal year 1983/fiscal year 1987 period?

General MALONEY. The adverse impact on Army readiness could reduced, from the tank asset point of view, by accelerating unit "changeovers" from M-60A1's to M-60A3 tanks. Four battalions per year are scheduled for changeover currently. An increase in this schedule would require an increased number of new equipment training teams to provide on-site training, an increase in the training base to produce more A3 qualified personnel faster, and corresponding increases in tank processing/deprocessing activities at installations. An additional concern that is hard to quantify is the effect an accelerated changeover would have on unit readiness due to the increased level of equipment turbulence and the time the increased number of battalions would be in training prior to achieving the highest level of military skill with the A3 tank. I hasten to add, however, that the potential benefits of this sort of program adjustments could be offset if the M1 program is reduced at all. Please keep in mind that M1 abrams unit changeovers also yield M60 tanks that support the A3 conversion program. The additional costs over that currently programed for an A1 to A3 maximum rate conversion program are:

[In millions of dollars]

	Fiscal year—				
	1983	1984	1985	1986	1987
Procurement	290	299	305		
OMA		107	107	107	
OMA transportation		8	8	8	

TANKS IN UNITS OR WAR RESERVES

Senator LEVIN. Even though there might be temporary shortages of tanks in units or in war reserves while tanks were undergoing modifications, would the increase in

capability afforded by an acceleration of the modification program offset this temporary impact on readiness?

General MALONEY. Moderate temporary shortages of tanks are certainly tolerable in the interest of modernization. The effect of ramping up to and sustaining a conversion rate of 1,200 conversions per year could last from one to three yars while the shortages could be measured in hundreds of tanks. A balanced maximum conversion rate program not exceed 720, perhaps 770, conversions per year. This maximum rate, given the current programed M1 production rates, an acceleration of M60A1 to A3 battalion change overs from the current four programed to six or eight per year along with an appropriate accelerated return of those prepositioned war reserve material stocks which would eventually exceed our requirements in Europe, strikes a tolerable balance in the modernization versus readiness equation.

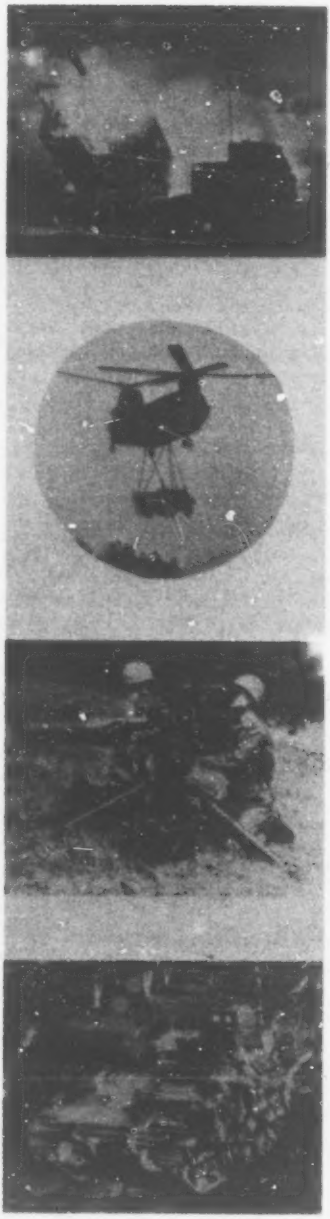
M1 TANK PROGRAM

Senator LEVIN. For fiscal year 1981 $71 million in advance procurement supported a procurement program of $1,355 million for the M-1 tank. Advance procurement was thus five percent of the program to be supported in that year. The request for advance procurement for fiscal year 1983 is $432 million—or 18 percent of the $2,383 million anticipated for the M-1 program in fiscal year 1984. Why has the advance procurement requirement for the M-1 grown at this rate over time? What is the economic benefit to the government for this early investment of funds?

General MERRYMAN. The fiscal year 1983 advanced request of $432.3M to support fiscal year 1984 regular procurement is the first M1 budget request that fully funds advanced procurement requirements. The smaller amounts (as percentages of regular procurement) prior to fiscal year 1983 did not fully fund requirements. Long lead contracts in those years were awarded with special, OSD approved, provisions limiting the Government's liability to termination level only.

During calendar year 1982, the PM will fully study advance procurement requirements with the goals of minimizing the advanced procurement funding and establishing a constant percentage level of long lead funding for the remainder of the program.

The economic benefit of advanced procurement is program stability, reduction of risk, and assurance that necessary components and hardware with long lead-times will be on hand to support production.



Equipping the United States Army

a statement to the Congress on the FY 83 Army RDTE and procurement appropriations

DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 20310

February 8, 1982

Members of Congress:

This prepared statement is intended to provide you with our views on why it is essential to quickly modernize and equip our Army. The introduction, which requires about ten minutes to read, provides an overview of the threat we face, our research, development and acquisition objectives and our personal views on many contemporary issues attendant to the materiel acquisition process.

Following the introduction are several sections that group our hardware systems according to their roles on the battlefield. We call these groups "mission areas". The importance of the mission areas cannot be overstated because our requirements for developing new or improving existing systems originate from analyses, designed to reveal the strengths and weaknesses, of these mission areas. We hope that our discussion of each mission area will make the Army's request for each system more meaningful by describing how those systems will make our Army more effective on the battlefield.

In addition to this statement, we are also making available to you the "1982 Army Weapon Systems" handbook, a consolidated reference for a number of our weapon systems.

We are honored to represent our Army and look forward to working with you in this session of the 97th Congress.

J. R. Sculley
Assistant Secretary of the Army
(Research, Development and Acquisition)

JAMES H. MERRYMAN
Lieutenant General, GS
Deputy Chief of Staff for Research,
Development, and Acquisition

NOTE:
The handbook "1982 Army Weapon Systems", is retained in the files of the Senate Armed Services Committee.

INTRODUCTION

This is our first appearance before the committee, and it is a privilege to be here to explain how our Army proposes to arm and equip itself. We look forward to working with you to meet our common goal--that of providing a first-rate Army.

We understand and appreciate that Congress must fund not only for defense needs but also for many other programs which relate to the well-being of this country and its citizens. To assist you in your efforts the Army is determined to do the best we can to efficiently manage the resources that you make available to us, while equipping and modernizing an Army of which all Americans can be proud--an Army that can fight and win.

In past years witnesses before the committee often referred to Army budget requests as "austere" and "severely constrained." We will not use those words today because the recent budget increases represented by the FY81 Supplemental and FY82 Amendment were important first steps toward resolving significant deficiencies. Those measures permitted increased funding and improved production efficiency on our most critical items. This favorable trend must be continued if we are to insure that the gap that exists between Soviet forces and ourselves does not widen. Today, we are presenting you with a combined procurement and RDT&E budget request of $22.13 billion for FY83. We will use these dollars to field an Army with improved near term readiness, to modernize the force, and to support research and development.

Near-term readiness is a must. This is because we simply do not know when or where our Nation might be confronted or challenged by an enemy. We do know, however, that our Army must be prepared to defend our national interests whenever and wherever they are threatened.

Today the Army is short a large amount of equipment which is needed to bring units up to full strength and to fill war reserve stocks. There are units today--Active, National Guard, and Army Reserves--which simply do not have all of the equipment they should have. Reduction of these equipment shortages in the force must take highest priority. To accomplish this, additional quantities of current equipment must be procured as quickly as possible.

The requirement to equip our Army takes on increased importance when one considers the quantity of equipment the Soviets have produced and are producing as a result of an

enormous investment program. Today the Soviets outinvest and outproduce us by about a two-to-one margin in most categories of military equipment.

Just as the Soviet numerical advantage increases the importance of equipping our Army, the additional threat posed by the ever-increasing quality of Soviet weapons dictates a need to accelerate our modernization effort. To put our modernization requirement in proper perspective, it is necessary to consider what has happened in the past.

During the late 1960's and early 1970's the conflict in Southeast Asia diverted the nation's attention and resources. The Soviet Union exploited this opportunity to mount the most massive modernization effort any nation has ever undertaken in peace time. During the decade of the 1970's, total Soviet expenditures for procurement exceeded our outlays by approximately 75 percent and their research and development expenditures were approximately 50 percent higher. The result was predictable. The combination of high procurement rates and sustained investment in R&D has closed and, in many cases, eliminated the quality advantage on which we have depended.

The Soviets have often fielded two, and sometimes three, generations of equipment while we fielded one. As a result, much of what they have in the field today is newer than deployed US equipment and embodies current technology. For example, the T62 Soviet and M60 series US tanks were fielded in the same approximate time frame. Since then, the Soviets have fielded two entirely new tanks, the T-64 and the T-72, as well as product improved variations of each. We also have seen evidence of a probable prototype of what the intelligence community refers to as the Next Soviet Tank. During this same time frame we have modified the M60 twice and have only recently begun to produce the M1.

Another example of a system which is qualitatively inferior to its Soviet counterpart is the M113 armored personnel carrier. The M113 was first built in 1961 and is a transportation system rather than a fighting vehicle. Due to its power and suspension system limitations, the vehicle is unable to keep up with our newest tank forces, and its only armament is an unstabilized machine gun. The Soviet BMP, with which the M113 is often compared, is actually an armored fighting vehicle and has far better battlefield mobility than the M113. It is armed with a 72mm gun and an antitank missile, and is capable of operations in a chemical environment.

The tank and fighting vehicle are but two examples of a growing list of systems where the Soviets have moved ahead of us in quality in addition to quantity. Considering the technological capability of this great nation, we find it totally unacceptable for us to allow the Soviets to field better equipment. Fortunately, the means by which to correct this qualitative imbalance are at hand.

The Army's research and development efforts of the past decade are now coming to maturity. We have pursued a program that will enable us to regain the qualitative edge, and we believe we have accomplished that objective. Today we have systems such as the M1 Abrams tank, the Black Hawk helicopter, and the Stinger air defense missile in production and in the field. Other systems such as the Multiple Launch Rocket System (MLRS), the Infantry Fighting Vehicle (IFV), the Division Air Defense (DIVAD) gun, and the Advanced Attack Helicopter (AAH) are headed for full production.

We are proud of the systems that have been developed during the 1970's, however, it would be incorrect if we led you to believe that the Army's materiel acquisition philosophy dictates a new development program for every change in the threat. On the contrary, we recognize that we live in a world of constrained resources and must take maximum advantage of the investment we have made in fielded systems. To do this we have used, and will continue to use, product improvement programs that are designed to build on those systems which are already in the inventory.

The M60 series tank--a product of the late 1950's technology--is one example of evolutionary development through product improvement. Improvements which have been made to the basic M60 tank include engine changes which have upgraded reliability and maintainability, a stabilization system for shoot-on-the-move capability, and passive infrared sights to improve night vision. The latest version, the M60A3, incorporates a laser rangefinder, thermal sights which penetrate darkness and obscurants, and a ballistic computer which automatically lays the gun for the correct range and lead angle. The result is a 20-year old tank which continues to be a formidable opponent on today's battlefield.

The CH-47 Chinook medium-lift helicopter, which was fielded in 1962, is another example of our product improvement program. The modernization program currently underway will extend the useful life of the CH-47 fleet beyond the year 2000. The Chaparral and Hawk air defense systems, the TOW antiarmor missile, and the Cobra attack helicopter are but a few of many other systems which have had their operational capabilities upgraded and lifetimes extended by product improvement.

It must be recognized, however, that the improvement potential of any given system is limited. For example, some of our current air defense systems were simply not designed to function in the sophisticated electronic countermeasures environment which the Soviets are presently capable of establishing. They are also incapable of multiple target track/multiple engagement operations. The technology which makes that capability possible did not exist 20 years ago, and it is impractical to attempt to build it into an obsolete system. Therefore, we had to develop new, more capable weapons. In large measure, Patriot, the Division Air Defense (DIVAD) Gun, and Stinger, the products of the decade of successful research and development we referred to earlier, are ready to fill the gaps where older systems are inadequate, and where the potential for improvement has been exhausted.

Although we strongly believe that we should use our nation's technological strengths to counter the Soviet Union's quantitative advantage, you should be aware that our acquisition philosophy also considers the impact of "complexity" and "sophistication." Some contend that our new systems are too complex and sophisticated. Unfortunately, these terms are often mistakenly used synonomously. Complex by our dictionary translates to complicated and what is complicated in terms of operation or maintenance is to be avoided. Sophisticated equipment, on the other hand, takes advantage of the best features of advanced technology. Such sophisticated equipment can be made easy to operate and maintain. For example, the checkout counter at your local supermarket is sophisticated. It depends on the complexities of laser scanners, holography--three dimensional imaging--and micro computers. However, the operation is fast, simple, and accurate, and repairs are normally based on a simple modular replacement concept. We try to apply the same logic in developing our military systems that range from a relatively simple laser rangefinder to the automatic search and track radar of the Division Air Defense (DIVAD) gun. Our objective is to use the best features of technology to obtain greater simplicity for the operator and maintainer. We understand that the country cannot afford an army of PhD's to operate its sophisticated equipment; the average American soldier must be able to operate and maintain it.

We also try to use technology to bring about a synergistic effect on the battlefield. This is because we have found the capability of our weapons used in combination is greater than the sum of their individual capabilities. For example, our fire direction system, TACFIRE, gives us an automatic data processing system which enables our artillery to be highly responsive to fire missions. The Firefinder counterbattery radar system can locate enemy artillery positions by backplotting the trajectories of projectiles while they are still in

flight. In combination, TACFIRE and Firefinder can provide the enemy's location to our guns before the first incoming round hits. Thus, our artillery can bring fire to bear on the enemy before he can adjust fires or "shoot and scoot." Individually, both TACFIRE and Firefinder perform important functions in fire control and target acquisition. When used together to engage highly mobile enemy artillery, the results are devastating. On the battlefield, systems such as these complement one another and make it possible for a small quality Army to defeat superior numbers.

It is true that sophistication increases the cost of our equipment. Therefore, we must insure that we do not ask for more than we require or pursue technology that is unnecessarily complex. On the other hand, we must use sophistication when it makes sense to achieve the necessary effectiveness and survivability in battle. For example, night vision and thermal imaging devices are expensive, and systems such as the M1 tank, the Infantry Fighting Vehicle, and the Advanced Attack Helicopter would cost less without them. To eliminate them, however, would deprive our soldiers of a necessary capability that gives them an edge on the battlefield.

Earlier in our testimony we expressed our appreciation for the support which the Congress has provided, and stated our intention to provide efficient management of the resources that you provide. During the FY82 authorization and appropriations process you provided us with several tools which we believe will help us to improve our management efficiency. We especially appreciate your actions to:

o Expand the authority for multiyear contracting and increase the cancellation ceiling.

o Raise the ceiling under which the Service Secretaries may delegate approval authority for negotiation of contracts for experimental, developmental or research work.

o Raise the reprogramming thresholds for both R&D and procurement programs.

Efficient management is especially important today. When the nation is reducing the amount of money which is going into other Federal programs, it is only right that the defense program receive intense scrutiny. It is clearly our responsibility to insure that we are spending the taxpayers' dollars as carefully as we can, and to see that the Army gets the best return on each dollar it invests in weapons and equipment.

In this regard the Army is seeking to improve its ability to control costs and improve program stability. There are economic, political and technological factors which are beyond our control, but we can improve our management. Some of the things we are doing include investigating ways to better discipline our cost estimating process, our fiscal management process, and our program change procedures. These objectives are being pursued in management and cost discipline efforts which are underway throughout the Army. Among the most promising initiatives are:

o Development of an Army-wide plan to upgrade the Army's cost estimating capability with emphasis on the identification and improvement of those areas where the data base is inadequate or the methodology poor.

o Display of cost ranges due to inflation rate changes, and of uncertainty ranges in cost estimates.

o Requirement of a comprehensive annual update of life cycle cost estimates for all major weapons systems and selected non-major systems.

o Consistency in addressing inflation programmatically and in contracts, with particular attention given to the management of inflation by the contractor.

o Tying the decisions made in the materiel acquisition process to the Army program and budget. As an example, during our recent production decision review of the Apache Attack Helicopter (AH-64), significant program changes were made. The costs associated with these program changes were accommodated from within the Army's resource allocation by trading off other program activity of a lower priority. This process contributes greatly to improved fiscal management and disciplines cost growth.

The Materiel Development and Readiness Command (DARCOM) has the responsibility for executing most of our research, development, and acquisition program. DARCOM is also taking action to improve control over acquisition programs by increasing the visibility of unfavorable variances or trends. An annual execution plan will be used as a common basis for management reviews, and a cost baseline will provide an unequivocal program cost track. Monthly status reports will be the basis of evaluations which will be the alarm system for variances in costs, schedules and technical changes. This early information on potential cost growth is necessary so that we can identify the causes and make timely decisions on alternative courses of action.

Finally, you are aware of the efforts that Secretary Weinberger and Mr. Carlucci have made to improve the materiel acquisition process. Mr. Carlucci's review of the materiel acquisition process resulted in 32 recommendations to improve the system. The four major thrusts are to lower costs, shorten acquisition time, improve weapons support and readiness, and improve the administrative process.

We stand firmly behind those initiatives and are playing an active role in their implementation. We would like to discuss five of the recommendations which relate to management and cost control:

- o Multiyear procurement
- o Economic rate production
- o Competition
- o Preplanned product improvement
- o Long-range planning

Multiyear procurement is an acquisition management tool that can yield substantial dividends. It is estimated that multiyear procurement could result in significant dollar savings in unit procurement costs through improved economies and efficiencies in production.

While we are positive about multiyear, we recognize that it is not a cure-all. Therefore, we are proceeding cautiously and are evaluating each candidate on a case-by-case, benefit/risk basis. We know that anticipated savings are not automatic. Higher costs in the early stages of production can lead to savings because of economic order purchases made at that time. However, substantial savings are dependent on accurate cost projections and a successful conclusion of the multiyear contract.

With these thoughts in mind, our FY83 budget request identifies the Multiple Launch Rocket System, Black Hawk helicopter (which includes the T700 engine produced by General Electric) and the ALQ 136 Radar Jammer. If these three programs are supported by the Congress, we expect to generate savings to apply to other programs that will be suggested for multiyear procurements in subsequent budgets.

The cost and time needed to put a weapon system into the field can be reduced by establishing and sustaining economic rates of production. Economic rates of production

will enable the Army to equip and modernize its combat units more quickly, and will decrease the time period over which programs are vulnerable to cost growth brought about by inflation. Accordingly, within the Army's projected resources, we have requested FY83 funds to support the production of many of our systems at more economical rates than in the past. The immediate result is higher costs for the near years, but the payoff will be lower total program and unit cost--in addition to the more rapid delivery of weapons and equipment.

If these programs are to be successful, the Army must work hard to improve stability and efficiency. In addition, continued fiscal support from Congress will be necessary.

Competitive R&D and procurement

We believe that contracts for the research and development and production of our systems should be competed to the extent practicable. Currently all Army contracting activities are developing management plans to ensure maximum competition. These plans will address specific actions to enhance competition in our materiel acquisition process.

Evolutionary development

The use of evolutionary alternatives rather than a revolutionary system development to meet a threat is a management principle which the Army has followed for some time. The product improvement programs we described earlier were based on evolutionary changes and contributed to program stability by making the system change process more systematic. Our improvement programs of the future will continue to build on the potential that exists in current systems. For new equipment, we will examine the feasibility of preplanned product improvement (P^{3}I) which should give us needed development time to consider future requirements and preclude the use of high risk or unproven technology in newly fielded systems.

Long range planning

To assist us in determining what systems should be considered for preplanned product improvement and those areas in which new developments are required, the Army uses a long range planning process. Long-range research, development and acquisition planning provides a roadmap of how to get to the Army required for the future and takes into account the future impact of current decisions with the objective of stabilizing the acquisition process.

This year's plan covers 15 years--FY84-98--and lays out how the Army will develop and acquire the materiel it will need to fight in the 1980's, 1990's, and beyond. It also allows us to examine affordability early in the development process. As part of the plan's formulation our Army Staff planners look to both the combat developer, who speaks for

the soldier in the field, and the materiel developer, who analyzes our technology. In this fashion the Long Range Plan balances our needs with production opportunities and capabilities. This balance insures that we are on the correct path to achieve the global response capability our Army requires.

Our long range plan also provides focus for the Army's technology efforts and overall research and development program. This is extremely important, since we must rely on our technical capability in order to overcome Soviet quantitative and qualitative superiority. R&D funds are truly seed money for the future.

In 1974 Mr. Norman Augustine, then the Assistant Secretary of the Army for Research and Development, directed that an analysis be conducted to measure the qualitative contribution which Army R&D had made during the 10 year period 1964-1974. The resultant analysis measured the difference in total effectiveness of a European Army Corps as equipped with 1964 and 1974 weapons systems in identical numbers. This analysis showed that the introduction of new and improved weapons systems from 1964 through 1974 generated about a one-third increase in the ground combat effectiveness of the corps studied. The TOW antiarmor system was judged to be at least twice as effective as the family of rocket launchers and recoilless rifles it replaced. Improved munitions for 155mm and 8-inch howitzers more than doubled the effectiveness of nondivisional artillery units. The same order of improvement was found in low and medium altitude air defense coverage because of the capabilities of Improved NIKE-HERCULES and Improved HAWK, and the relatively new Chaparral, Vulcan and Redeye systems.

We think the same analogy applies today in looking to the future, and we must be prepared to take advantage now.

In the near future the TOW 2 and the laser-guided Hellfire missiles, the Copperhead precision guided munition, and an entire family of new air defense weapons hold the potential for even more dramatic increases in combat effectiveness. For the long term we are looking to a completely new family of terminally-guided munitions which will provide a fire-and-forget capability to both air and ground systems, new developments in laser weapons, and means by which to transfer the burden of operation and maintenance from man to machine. Research and development dollars have made these kinds of advances possible and will also determine our future capability. Our objective is to retain technological

superiority where we have it, regain it where we have lost it, and exploit it to maximize combat effectiveness.

The Army research and development program includes the basic scientific research and exploratory development (our technology base) and developmental and engineering efforts directed toward improving current systems and fielding new weapons and equipment in the near future. In the FY83 budget request we allocate approximately 15% of our research and development funds to the technology base, and the remainder to developmental and engineering efforts.

Our technology base efforts are specifically directed to take advantage of technologies in which the US enjoys a lead and for which a need exists. For example, our capabilities in areas such as automatic data processing and microelectronics represent national strengths which the Soviets cannot match. By applying such leverage technologies we can develop and field equipment which will enable us to fight our kind of battle rather than an enemy's. With this focus in mind, a large share of the Army's FY83 technology base funding will support work in five thrust areas which are listed as follows:

o Very Intelligent Surveillance and Target Acquisition (VISTA). Technology which will allow the incorporation of enormous computational power and data processing capabilities into individual sensors and combination of sensors. This area goes well beyond the technology embodied in the current surveillance and target acquisition systems. VISTA is intended to be an information gathering and processing system that provides real-time or near-real-time target identification and location information to commanders at each level. Major advances in Very High Speed Integrated Circuits and very large scale integration makes attaining the VISTA concept possible. Ongoing programs in fiber optic technology, millimeter/near-millimeter wave technology, focal plane arrays, and active infrared imagery all have application to VISTA.

o Command, Control, Communications, and Intelligence. Development of dispersed, survivable command and control nodes with application down to the small unit level. The ultimate objective of this thrust is to design the architecture and systems to integrate battlefield information from all assets on the battlefield, distribute what is needed by each commander, and provide the opportunity for him to interact with a display/computer to permit precision fighting. Micro-chip technology, mass storage media, and interactive display technologies provide the technological development base to accomplish dispersion command and control. Programs

such as the position location reporting system and joint tactical information distribution system are helping us develop the robust communications needed to support the concept.

o Self-contained Munitions. The successors to the so-called "smart" munitions of today. The thrust is to develop munitions which will require no external designation to destroy the target. Built into the munition will be the ability to sense, identify, and home on targets without requiring an aircraft or soldier to spot and direct a laser beam designator at the target. This includes artillery sensor fuzed munitions and fire-and-forget missiles. We are developing Sense and Destroy Armor (SADARM) in the 8 inch caliber, and are working towards the evolution of a modular seeker and guidance package for the 155 mm field artillery projectile.

o Biotechnology. Research and development efforts which emphasize the application of novel technologies, such as genetic engineering, and treatment of casualties on the integrated battlefield to include development of vaccines and antidotes. In addition, because of delays in evacuation or treatment, traumatic shock requires that research be performed to develop new treatment compounds, analgesics, and blood substitutes.

o Soldier Machine Interface. The transfer of operational burdens to the machine, and a reversal of the trend toward manpower intensive systems. This area seeks exploitation of our society's unique abilities and opportunities to interface with computers. The objective is to maximize combat power by optimizing performance of both soldiers and equipment, individually or in combination and to achieve effectiveness equal to design capabilities of a system while not increasing a requirement for human skills not currently available in typical Army units.

Our developmental and engineering research and development efforts are oriented toward the fielding and improvement of specific systems, rather than toward the general research and testing supported in the technology base. Such directed efforts have resulted in the development of new systems across the entire spectrum of our mission areas--the M1 Abrams tank and Bradley Fighting Vehicle, the Apache Attack Helicopter, the Patriot and Stinger air defense missiles, the Multiple Launch Rocket System, and many others. Additional systems such as the Pershing II and the Fire Support Team Vehicle (FIST V) are in the final stages of development, while the Lightweight Air Defense System is in

the conceptual stage. In addition, research and development funds support the improvement of existing systems. Such improvements range from the development of a particle separator to protect the Cobra helicopter's engine from sand and grit, to the block of preplanned product improvements we have projected for the Abrams tank.

The importance of an adequate research and development program has seldom been greater. Today the Soviet Union supports about twice the effort that we do in military research and development and is graduating five times as many engineers as we are. The quality of their weapons has continued to improve due to their past R&D investment, and, due to the size of their present program, we are now faced with the additional risk of technological surprise. With your support, we will prevent that from happening.

Throughout this discussion we have refrained from direct mention of the national resource which transforms the plans for equipping, modernizing, and conducting research and development into reality: the nation's industrial base.

The capability and responsiveness of the industrial base have been a matter of concern to all of us for some time. We in the Army have been encouraged by the recent improvements we have seen. For example, last year for the first time in 20 years the Congress appropriated funds to support additions to the National Defense Stockpile. In addition, industry now has tax incentives which support capital investment and President Reagan and the Congress have made it clear that the reindustrialization of America is a matter of concern.

In conjunction with national efforts to reindustralize America, the Army has increased its emphasis on that portion of industry which most serves our needs. Recognizing the need to direct more resources into this vital area, the FY83 budget request related to the industrial base is fifty percent greater than the original FY82 request. The requested funds will finance production improvements which should result in more timely and efficient peacetime procurements as well as improve industry's ability to deliver increased quantities of equipment in time of emergency or mobilization.

Most of the resources in the budget request will be directed toward establishing and expanding facilities to produce new types of equipment such as ammunition for the 120 mm tank gun. The budget will also finance modernization of existing plants and arsenals and fully supports the lay-away and maintenance of our reserve standby plants and equipment.

The FY83 budget request will also provide resources to improve manufacturing processes and reduce production costs. The Manufacturing Technology Program seeks to improve production methods for high cost equipment items and technologies such as explosive manufacturing processes, which have limited civilian application. This program has resulted in process improvements having an average monetary payback to the Army of three to one. Complementing this program is the Industrial Productivity Improvement program. Although resources for this new effort are limited, the expected benefits are large. The Industrial Productivity Improvement program is directed toward key contractor and government plants involved in large, high-dollar production. Many of these plants are producing multiple products for the Army and DOD. The program initiates a top-down systems approach to modernizing an entire factory rather than piecemeal process improvements. The Army expects to stimulate more private investment by contractors if Army "seed money" finances high-risk engineering and manufacturing technology.

The budget will also finance improvements in the Army's planning for the peacetime and mobilization industrial base. These improvements include contractual surge and mobilization planning requirements for our present contractors plus more thorough planning and analysis of the voluntary industry mobilization planning agreements.

While the improvements in our industrial preparedness program are important, we believe that the greatest impact in improving our industrial base would result from program stabilization. In 1980 the Army hosted some 30 chief executive officers from industry during a Mobilization Exercise (MOBEX 80). At that forum, recommendations for improving the posture of the national industrial base were received from members of the industrial and government communities. A follow-on session of that group was held in May 1981 at which the recommendations were discussed. At both meetings the participants cited instability in defense acquisition programs as a major cause of industrial base problems.

If this situation is to materially improve in the long term, both the Army and the Congress must be committed to the idea of program stabilization. With your actions in passing the legislation that made multiyear procurement and other favorable legislative proposals possible, and in providing funds to support more economical rates of production, we are taking an important step toward improving the industrial base. We request that you continue to provide the necessary support in the future so that program stability can be realized. The United States cannot be a first rate military power with a second rate industrial base.

You are invited to continue reading through the mission area chapters that follow so as to gain a better appreciation for how the efforts we are making now assure us of a better Army both for today and tomorrow.

CLOSE COMBAT

The close combat mission area relates to weapons and equipment which are used to bring direct, line-of-sight fire upon the enemy. The soldiers who fill this role are often referred to as "front line troops" and their job is to close with and destroy the enemy. To do so, they must be well led, well trained, and provided with the equipment that will give them an edge over their adversaries. The next several paragraphs will describe those close combat equipment systems for which we are requesting funds in the FY 83 budget request. We will cover this subject area by first addressing armored, mechanized systems, then aviation systems, missile anti-tank weapons, and finally individual weapons.

The main offensive weapon of both the US and Soviet ground armies is the tank. In a combined arms role, tanks can dominate the battlefield, spearheading the offensive, killing other tanks, devastating "soft" targets, and driving through defensive positions with massive momentum. The tank is essential to success on the modern battlefield. The Army's tank of the future, the M1 Abrams, is the most powerful, mobile, and survivable combat vehicle we have ever developed, and we believe that it can outperform any other tank on the battlefield.

M1 Abrams

The agility of a tank is a major element in the effectiveness equation. A 1500 horsepower turbine engine supplies the Abrams with double the power of its diesel powered predecessor, the M60. Its stabilized sighting system ensures that speed is combined with accurate firepower. Tankers are able to routinely hit 5-foot targets over a mile away while moving rapidly cross country.

This kind of on-the-move accuracy is made possible by design features of the M1's fire control and improved suspension systems. The gunner puts his sight on the target and finds the range using a laser rangefinder; a computer automatically determines the ballistic data and adjusts the lay of the main gun; the gunner need only squeeze the trigger to hit a target.

The future battlefield will be thick with anti-tank weapons. Therefore, the M1 tank is protected by a special type of advanced armor, and its low silhouette coupled with

M1 Abrams

its agility reduces its chances of getting hit. If an M1 is penetrated, a number of revolutionary safety features will greatly enhance crew survivability. This includes an automatic fire detection/extinguishing system and armored compartments that separate the fuel tanks and main gun ammunition from the crew.

The Abrams' passive thermal imaging system allows location of targets at night and through dust, haze, fog, and smoke while not disclosing the tank's position.

The main armament of the Abrams tank is a 105mm rifled gun that fires chemical energy and improved kinetic energy rounds. Although the current armament, utilizing modern technology kinetic energy rounds, will defeat the fielded threat, later versions of the Abrams will incorporate the German designed, US manufactured, 120mm smoothbore gun. The addition of the 120mm gun to the M1 tank fleet will insure that US tanks can keep pace with anticipated movements in Soviet armor expected in the late 1980's and beyond. The major advantages of the 120mm gun system are greater kill capability and growth potential to meet advanced threat armors.

Design criteria make interesting reading, but the real proof comes during operations by soldiers. Last year, troops of the 1st Cavalry Division at Fort Hood, TX, participated in an evaluation of the M1 to determine its operational suitability and logistics supportability. The Abrams tank battalion logged about 35,000 miles and 8,000 hours of engine operation. The unit culminated its evaluation with a 96 hour field exercise based on a scenario designed to match or exceed the most stressful missions they would meet in combat.

The soldiers' appraisal of the M1 can be summed up in one word--winner! They found the M1 Abrams generally easier to maintain than the M60 tank, and able to shoot more accurately at night than the M60 can in the daytime.

Our soldiers found that the M1 unit can cross a chaotic battlefield at better than twice the speed of an M60 unit. They know that the Abrams will take hits which would destroy an M60. Features like these increase survivability, and survivability has the biggest impact on a soldier's confidence--a factor that breeds fighting effectiveness that will win on the battlefield.

The Army has completed fielding an M1 battalion at Fort Hood, Texas, and is preparing to field M1 battalions in Germany. All resources required to support the fielding of these battalions are in place at the training site in Vilseck, and a well prepared cadre began to train the first battalion in January of this year.

The FY 81 and 82 budget adjustments allowed a production increase from 30 to 60 tanks per month. The FY 83 budget will support a planned production ramp leading to 90 per month. This rate of 90 M1's per month is expected to be achieved in February 1985, the first month of the FY 84 funded delivery period.

M60A3

Even though the Soviets have fielded two tanks that are considered marginally superior to the M60A3, this quality tank will continue to see service into the 1990's as the low element of our high-low tank mix. The high-low mix strategy, which is used throughout the equipment area and is not new, is simply an acknowledgment that we cannot

replace our entire fleet of M60 series tanks with the M1 in the immediate future. Accordingly, we will continue to upgrade the M60 series tanks that remain in our inventory by improving fire control systems, main gun stabilization, and building in better overall system reliability. The top-of-the-line M60A3 model incorporates a laser rangefinder and a ballistic computer for automatic ranging and lead angle computation, and a thermal sight that gives the crew an improved capability to detect targets in darkness and on an obscured battlefield. The last programmed buy of new production M60A3 tanks for US forces was funded in the FY 81 budget. The production line is now building the last few tanks for delivery to the US Army while the bulk of production is to meet FMS requirements.

Existing sales requirements will assure a warm production line until November 1983 and additional future requirements may extend that date. Our FY 83 budget request will continue the conversion of existing M60A1 tanks to the M60A3 configuration.

Just as the European theater has dictated the need for heavy armored forces, the Army's global mission has demanded an increased focus on light divisions and the needs of those divisions. Both the Army and the Marine Corps have sized up their future requirements for anti-armor systems and agree that there is an urgent requirement to provide light forces with a weapon system that is strategically deployable, tactically mobile, and capable of conducting offensive operations on the battlefield. To meet this need we are jointly executing a competitive, off-the-shelf, Light Armored Vehicle (LAV) procurement program. Four contracts have been awarded requiring each contractor to provide four test vehicles, three equipped with a 25mm cannon and one equipped with a 90mm gun. A production contract award is scheduled for July 1982. The Light Armored Squad Carrier (LASC) will be a vehicle variant within the LAV program. Surrogates of the LAV's and lighter weight armored vehicles will be tested by the 9th Infantry Division at Fort Lewis, Washington. The 9th Division is the Army's test bed for evaluating new concepts for employment of light combat equipment. An Army decision pertaining to the LAV operational concept and vehicles will be made in June 1982. The FY 1983 Army budget includes procurement funds for LAV's with deliveries programmed for FY 1984.

While this unique procurement provides us with a good near term solution to the problem of providing mobility and firepower to our light forces, we must also

look to the future. We plan on using FY 83 funds to continue an in-house laboratory development of a far term joint Army and Marine Corps solution to the light force anti-armor/assault deficiency. We have signed a Memorandum of Understanding with the Marines for this development that we are calling the Mobile Protected Gun. This effort will explore the development of a new lightweight armored fighting vehicle with a 75mm automatic, hypervelocity, anti-armor cannon as the candidate armament.

The history of modern warfare has vividly demonstrated that armored vehicles are critical to success on the battlefield. Operating independently, however, they are vulnerable to anti-tank fires from enemy infantry. Therefore, infantry must be combined with armor to assure a blend of maneuver forces that will provide the flexibility necessary to defeat any threat. The Bradley Fighting Vehicle is an ideal partner for the M1. This vehicle has two configurations, the Infantry Fighting Vehicle (IFV) and the Cavalry Fighting Vehicle (CFV).

The IFV provides vastly improved cross-country mobility, firepower, and armored protection to the mechanized infantry

IFV

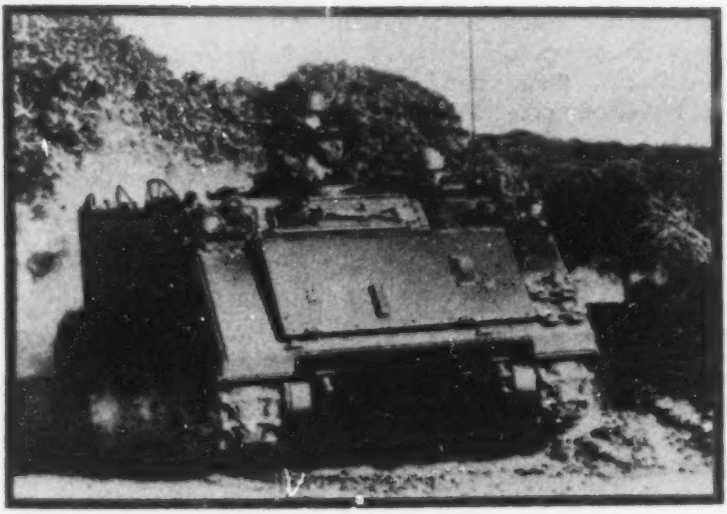
squad. In intense combat situations, the tank-infantry force must be supported on the move by continuous and accurate fire. The primary weapon of the IFV is a

stabilized, dual-fed 25mm automatic cannon. The commander or gunner can instantly select either high-explosive or armor-piercing rounds. The high-explosive round can destroy unarmored ground targets out to 2500 meters, while the armor piercing rounds are capable of penetrating and defeating the Soviet BMP. The two-man turret also has a two-tube TOW missile launcher and a 7.62mm coaxial machine gun. The TOW gives each squad the capability to engage enemy tanks at long range from overwatch positions. The IFV transports a nine-man infantry squad and enables additional fire-on-the-move capability through the use of modified M-16 firing port weapons for individual squad members.

The Cavalry Fighting Vehicle (CFV) is identical to the IFV, except for minor modifications for crew size and equipment. The CFV carries a five-man scout team and provides the cross-country mobility and mounted firepower necessary for armored cavalry and battalion scout squads to carry out reconnaissance, security, and economy-of-force operations.

Both the IFV and CFV have an inherent swimming capability and are air transportable in either the C-141 or C-5A aircraft. These fighting vehicles match the highway and cross country mobility of the M1 tank. Furthermore, they provide their crews and passengers significant protection against enemy small caliber weapons, artillery airburts and anti-personnel mines. A thermal night sight assures that this potent weapon system maintains its capability during night operations.

It is true that the IFV is expensive. It has even been suggested that the vehicle is so expensive that the Army should continue to buy the M113A2 Armored Personnel Carrier rather than introduce the Bradley. However, no vehicle available in the world today matches the all around capabilities provided by the Bradley. Although the M113A2 is inherently an excellent vehicle, which will remain in service for many other purposes, we need a vehicle like the Bradley that can meet the Soviet threat vehicle--the BMP--head-to-head and win.



M113A2

Compared to the Bradley, the M113A2 is slow, thinly armored, and mounts only a 50 caliber machinegun on an unstabilized, exposed mount. The troops inside are isolated from the battlefield. The Bradley has vision blocks, through which each squad member can view the battlefield and direct fires of their individual firing port weapons, thus permitting continuous observation of, and contact with, the enemy while on the move. Once outside the vehicle, troops can move toward the objective supported by a high volume of firepower from the vehicle's 25mm cannon, 7.62 coaxial machinegun, or the TOW missile system.

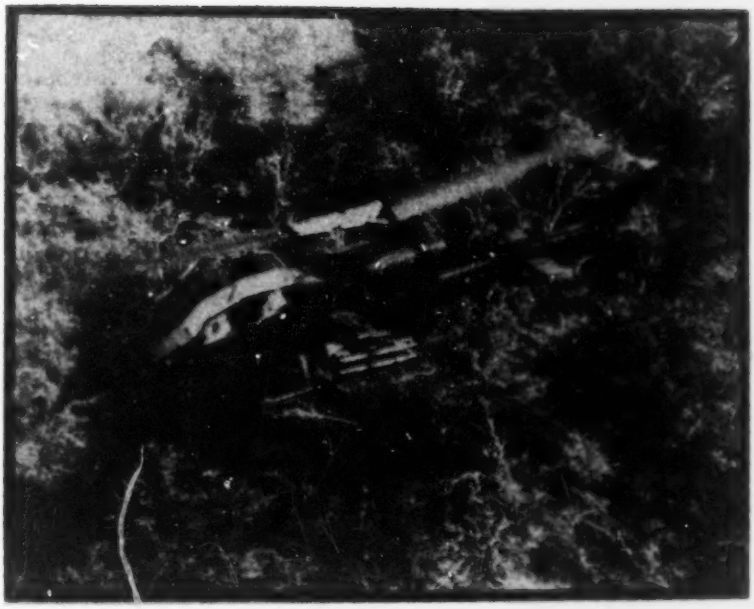
We share your concern about the cost of the FVS and an aggressive cost control effort is underway. These efforts include value engineering, manufacturing methods

and technology, and component breakout programs to help hold the line on production costs. These programs, plus the higher buy rates that your FY 82 authorization and appropriation actions made possible have reduced estimated total program acquisition costs. Additionally, the Army is analyzing a possible second source procurement strategy. We awarded three production analysis contracts in June 1981. The results of these efforts are due to the Army in March of this year for independent assessment. The Army will provide its decision on second source procurement to the Congress in June 1982.

The FY 83 budget supports the production of 600 Bradley vehicles. The first production vehicle was delivered to the Army in May 1981 and the first mechanized infantry battalion will be equipped in March 1983 at Fort Hood, Texas.

We move now to our attack helicopters. A ground attack on our forces in Europe will be spearheaded by masses of armored vehicles. Soviet doctrine stresses building overwhelming momentum with blitzkrieg-like tactics. Frontages in Europe mandate that we concentrate on their main avenue of approach and counter quickly with an active defense. Attack helicopters play a major role in any situation that requires our forces to react quickly. Attack helicopters are needed to fly quickly across a wide front to threatened areas that cannot be reached by armored forces which are either engaged in their assigned sectors or are too far away to influence the battle. Attack helicopters are also used to significant advantage in target rich environments where exploitation is feasible. Attack ships first saturate an enemy column with multi-purpose rockets--degrading the enemies front line air defense weapons--and then fire tank killing missiles.

The value of attack helicopters was first shown in Vietnam where the AH-1G COBRA had considerable success against lightly armored vehicles. In addition, the TOW was put on the Huey helicopter and knocked out a number of North Vietnamese Army tanks. After Vietnam, the TOW missile was mated with the AH-1G to produce the COBRA/TOW, or AH-1S, making it a true tank killer.

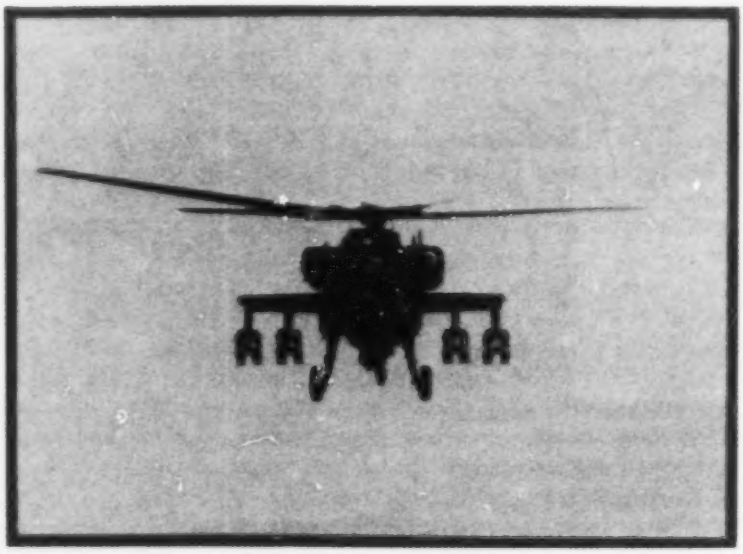


COBRA/TOW

Like the M60 series tank, the AH-1 COBRA helicopter has been continually upgraded to improve its operational capability, safety, and survivability. The COBRA is being equipped with an Improved TOW weapon system and with a limited night and adverse weather capability. While these improvements will contribute to its effectiveness and survivability against armor, the COBRA remains essentially a daytime helicopter with limited performance capabilities when operating in a typically Middle Eastern environment. The TOW missiles that the COBRA/TOW carries are wireguided so the pilot of the launching aircraft must keep the target in his crosshairs until missile impact.

We believe that attack helicopters will play a critical role in winning a future land battle. The large number of attack helicopters that the Soviets have fielded in recent years indicates that their leaders share this belief. Thus, the importance of attack helicopters, coupled with the recognition of the COBRA/TOW performance limitations, led to the development of the APACHE Attack Helicopter (AH 64). Armed with the laser guided Hellfire missile, the APACHE represents a significant jump in performance, firepower, and survivability when compared with its predecessor--the

COBRA. More importantly, the APACHE provides the Army a mobile, credible anti-tank capability that can be quickly deployed world wide to areas of key strategic concern well in advance of heavier anti-tank systems. APACHE's ability to operate world wide, in conditions that make the COBRA ineffective, may be the difference between success or failure until more conventional, heavier forces can be deployed to meet Soviet armor.



APACHE (AH 64)

The powerful, two engine APACHE has been designed from the start to perform anywhere in the world under the most demanding conditions of altitude and climate. Its speed and agility enable pilots to take advantage of the terrain, vegetation and even buildings to avoid detection. A target acquisition/designation sight and pilot night vision sensor enable the pilot to navigate and attack in darkness and on an obscured battlefield.

APACHE carries a formidable array of weaponry. The main armament is the HELLFIRE, a third generation anti-armor missile. HELLFIRE homes on a laser spot that can be projected from a number of sources including ground observers and scout helicopters as well as the launching aircraft itself. When targets are laser designated by another source, the AAH can fire its HELLFIRE missiles without exposing itself. Scout helicopters, equipped with sights and laser designators atop their rotor masts, will be able to spot and laser designate targets without breaking mask, and the AAH can ripple-fire at multiple targets while remaining completely hidden. HELLFIRE provides significant improvements over the TOW system in terms of greater lethality, greater standoff ranges, greater tactical versatility and shorter time of flight. APACHE's other armament includes the 30mm chain gun and 2.75

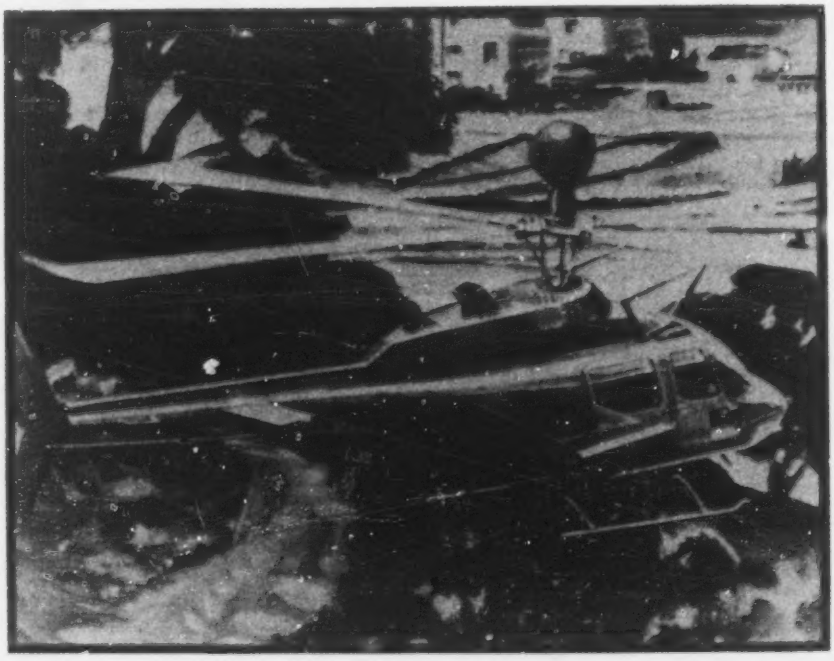
APACHE with HELLFIRE

inch rockets which are lethal against a wide variety of targets and complement the anti-armor HELLFIRE missiles.

The APACHE's performance characteristics, coupled with survivability features such as armor protection, redundant controls and electronic countermeasure equipment, make it one of the most survivable systems on the battlefield. The FY 83 budget provides for additional procurement of helicopters and a second buy of HELLFIRE missiles. The budget also funds continued performance and survivability improvements for the COBRA.

Earlier, we described how scout helicopters reduce the attack helicopter's vulnerability by acquiring and laser designating targets for it. Using scout helicopters to seek out and select targets also enables attack helicopters to conserve fuel and ordnance and allows the commander to concentrate his anti-tank capability at critical points and on established targets.

Currently, the Army does not have a Scout helicopter that is capable of performing satisfactorily with the attack helicopter or the Field Artillery. The Army Helicopter Improvement Program (AHIP) will upgrade part of the



Scout Helicopter

OH-58 fleet into an improved Scout Helicopter. Engine performance and rotor improvements will make the OH-58

better able to operate in a Middle East environment, and a mast mounted sight will incorporate a laser designator and FLIR capability for night and adverse weather operations. In addition to working with attack helicopters equipped with HELLFIRE missiles, the Scout will have the capability to acquire and designate targets for the Copperhead and other precision guided munitions.

The AHIP program, based upon modification of an existing light observation aircraft, complies with Congressional guidance and shows significant savings when compared with a new airframe development program. The FY 83 budget supports the fabrication and contractor testing of five prototype AHIP systems as well as long lead time item acquisition to facilitate production and an early initial operational capability.

The HELLFIRE missile, described earlier as the main weapon of the AAH, warrants more discussion. It is a laser guided missile capable of employment both in a direct and indirect fire mode. Mounted on the AAH, the HELLFIRE missile is faster, has longer range, and greater killing power than the TOW. Targets can be laser designated for it by its own AAH carrier, another AAH or Scout helicopter, or by a ground laser designator in the hands of armor, infantry, and artillery elements. This flexibility will keep the enemy guessing and limit his ability to counter the missile. The HELLFIRE's contribution to our combat resources makes its fielding a top priority among force modernization efforts for which we are requesting funds.

The TOW missile system, which is found on the AH-1S COBRA, the Bradley vehicles, Improved TOW vehicles, and wit dismounted Infantry, is the most powerful anti-tank weapon used by ground units. This long range (3750 meters) anti-armor system is a prime example of evolutionary development. First fielded in the late 1960's, the TOW is being improved to keep pace with the evolving Soviet tank threat.

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The first improvement, completed in 1981, is an improved 5-inch diameter warhead that provides TOW a greater armor piercing capability. The improved 5-inch warhead can be fitted on all existing TOW missiles and is compatible with all TOW system platforms including helicopters and tracked vehicles. The latest improvement, called TOW 2, will give the weapon an even more lethal 6-inch warhead, greater speed to reduce vulnerability and improved guidance in an "obscured battlefield"

TOW

environment. The TOW 2 has been tested on a variety of mounts to include the 1/4 ton truck, ground mount, M113 armored personnel carrier, and the improved TOW vehicle.

The Improved TOW Vehicle, or ITV, combines two existing weapon systems: the TOW missile and modified M113 armored personnel carrier. The system can fire 2

ITV

TOW missiles from its elevated armored launcher, and allows the crew to fire and reload under armor protection. In addition, the elevated launcher enables the crew to fire while the vehicle itself is hidden by a gulley, vegetation, or other terrain feature. Troop acceptance of the ITV has been excellent. The Commander in Chief, U.S. Army Europe and the Commander, FORSCOM, have made the decision to equip armored cavalry units with ITV until Cavalry Fighting Vehicles are available, at which time the ITVs will be reassigned to lower priority claimants.

In the medium anti-tank missile area, we are evaluating alternatives for the development of a replacement weapon for the Dragon. The RATTLER, formerly called the Infantry Manportable Antiarmor Assault Weapon System (IMAAWS), will be able to defeat the newer Soviet tanks and their replacements. A manportable anti-armor system is a must for tank fighting by the RDF and other light infantry. Technological concepts being considered for the RATTLER include Laser Beam Rider and terminal homing fire and forget. The RATTLER concept definition studies will make maximum use of the work performed by Defense Advanced Research Projects Agency's "Tankbreaker" technological demonstrations.

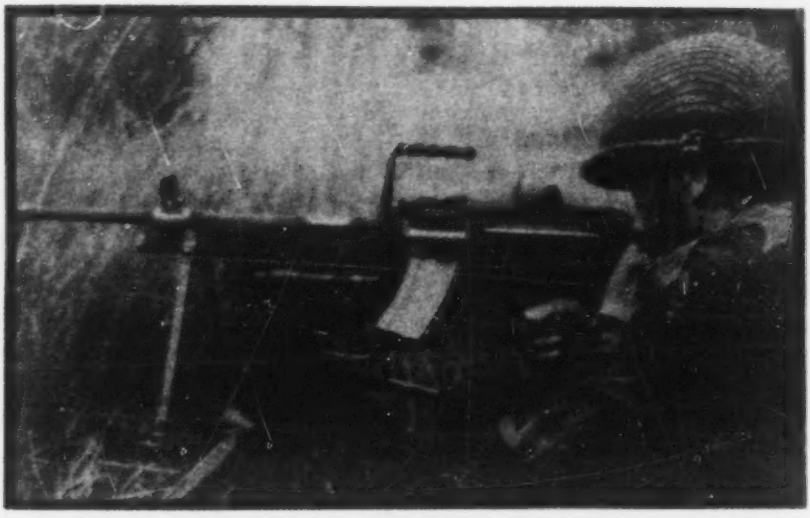
A close in, final protective, anti-armor weapon is vital to the survival of defending forces when confronted by enemy armor. The VIPER is designed to provide the anti-armor capability required in such critical situations.

VIPER is a short range, lightweight anti-armor rocket that replaces the LAW system which has been in our inventory for almost twenty years. By comparison, VIPER provides a higher hit probability, greater lethality, longer effective range, and increased reliability. Envisioned as a "last ditch" defensive weapon against enemy armor, VIPER also has an excellent capability against secondary targets such as wheeled and tracked vehicles, bunkers, and field fortifications. The FY 83 budget request will fund the third year of production for the VIPER system.

VIPER

As the rifle squad is the ultimate focus of close combat, it should have the organic capability to provide voluminous and effective automatic weapon fire. The squad's organic small arms systems now include the M16A1 rifle and the M203 grenade launcher. Two *soldiers*

are designated as automatic riflemen and are provided M16A1 bipods to support the weapon and to improve the accuracy of automatic fire. Even with the bipods, the maximum effective range of the automatic weapon fire is less than 500 meters. In order to improve both the accuracy and range of the rifle squad's organic automatic fire, we are buying a new squad automatic weapon (SAW).



SAW

This weapon is a light weight manportable machinegun capable of delivering a heavy volume of effective fire up to range of 800 meters. It will provide increased range and volume of fire and better penetration than the automatic M16A1 rifle. The fielding of this weapon will provide a significant increase in the squad's overall firepower capability. The 1983 budget will permit the procurement of 3579 systems. We will field the first of these systems in the third quarter of FY 83.

The mortar, although an indirect fire weapon, is included in the close combat mission area since it is used by forward combat units. For many years, the infantry has relied upon two separate mortar systems

to provide the volume and variety of fires needed on the battlefield. The 81mm mortar answers the need for a relatively lightweight system that can deliver a high rate of fire at ranges up to about 5km. The 4.2-inch mortar provided about 2km additional range and delivered a more lethal round of ammunition. As a part of the move toward lighter forces without sacrificing firepower, we are in the process of replacing both the current 81mm mortar and the 4.2 inch mortar with an improved 81mm mortar which capitalizes upon the advantages of both systems that it replaces. It incorporates a British manufactured mortar barrel with bipod mount and a US base plate and improved sight. It will fire an improved high explosive round that will accommodate a multi-option fuze and achieve extended ranges, increased accuracy, and improved lethality. Improved smoke and illumination projectiles are also under development. In addition to the US, the UK, Norway, and Canada are now using this improved system. Our budget request provides for the procurement of 352 systems.

Nightfall will no longer bring down even a partial curtain on battle activities. Because of advanced night vision devices, night will simply mean a slightly altered environment to soldiers in a future war. Night battles were conducted in the 1973 mideast war in total darkness. A noncombatant would have seen only the light of muzzle flashes and burning vehicles, yet both sides were exchanging accurate fire using night vision devices.

Until recently, devices to assist the soldier in "seeing" in the dark have had serious drawbacks. For example the use of active infrared night-vision devices dating back to before the Korean war "actively" emitted infrared light by which targets could be seen by looking through special lenses. However, if the enemy was also wearing special lenses, he could pinpoint the user as surely as if he had turned on a flashlight.

The latest night vision devices use passive thermal imaging. By sensing the temperature differences between objects and their surroundings, these devices can differentiate or "see" tanks, trees, people and anything else that has a temperature signature. These devices are sensitive enough to see through haze or fog; more importantly, they can see through the smoke that the Soviet units rely on to mask their armor movements. This is a technology area in which we clearly lead the Soviets. Night vision equipment is now in our ground forces for major systems such as TOW and Dragon anti-armor missiles and M60A3 and M1 tanks.

The surveillance, target acquisition, and night observation -- STANO -- Systems lend new force to the military adage, that "what can be seen can be hit". By reducing the enemy's capability to mass his forces and achieve surprise under the cover of darkness, these systems rob the enemy of two of his most effective tactics. Likewise, these STANO systems play a critical role in mounting a counter attack against superior manpower and hardware.

This concludes our overview of the close combat mission area and we will now move to the fire support mission area to discuss how the front line soldiers are supported.

FIRE SUPPORT

The Fire Support Mission Area includes those systems that are used to generate indirect firepower. The systems in this mission area include not only conventional, nuclear, and chemical firepower provided by cannons, rockets, and missile systems, but also the target acquisition and fire control elements integral to field artillery systems. This section will address the Army's longest range systems first - then will discuss direct support artillery weapons, the fire control and target acquisition systems, and finally ammunition developments.

Soviet doctrine emphasizes the use of mass, and echelonment in depth. Warsaw Pact forces believe that they can afford to attack with successive waves of forces, accepting massive losses of men and materiel as an acceptable price to pay for victory. We therefore are highly motivated to attack him deep in order to disrupt his formations and reduce his momentum.

We must be able to strike early and strike deep with great accuracy and massive firepower. We must also be capable of attacking his units up to the forward edge of our troop positions with concentrated, accurate, and readily available firepower.

The Soviet's early use of their own artillery will make this task even more difficult. Their doctrine stresses the use of concentrated artillery fire in coordination with blitzkrieg maneuver of troops. The Soviets greatly outnumber us in artillery and are capable of pounding our positions with massive amounts of indirect fires. Our own field artillery must be able to neutralize their indirect fire systems through effective counterfire.

Our current field artillery capability simply does not measure up very well against the requirements stated above. Until we get more of our new systems in the field, we will remain outnumbered, outgunned, and outranged by the Soviets. Fortunately, our new systems provide across-the-board improvements, and in many cases add new dimensions to field artillery capability.

The Army's most powerful weapon is the Pershing II, which has twice the range of the existing Pershing I and much more accuracy. The Pershing II system employs radar area correlation to achieve its pinpoint accuracy. Radar "pictures" of the target area, in cassette form, are inserted in the missile prior to launch. As the re-entry

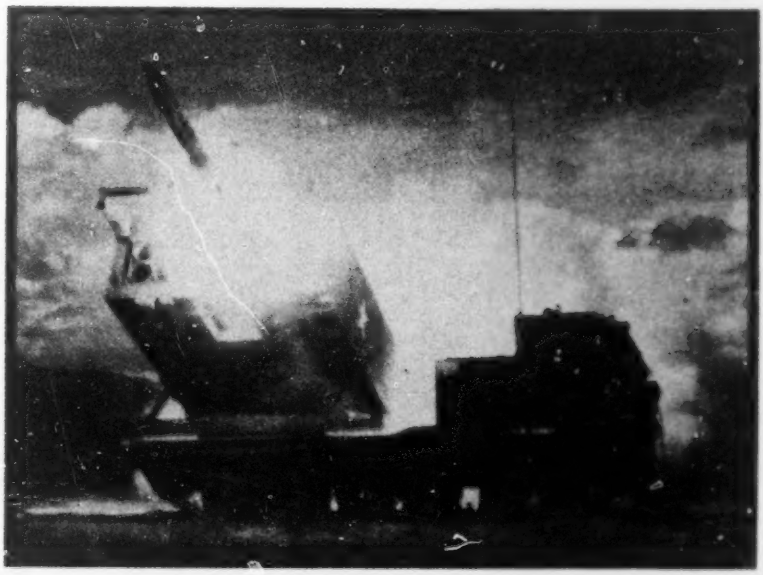
vehicle approaches the general target area it takes its own radar "pictures" of the terrain, comparing them to the original. By making course corrections until the two pictures coincide, the missile can achieve surgical accuracy. This permits the use of a

Pershing II

small nuclear warhead that reduces collateral damage to a minimum. Pershing II is in full-scale engineering development and is scheduled to be deployed in December 1983. FY 83 funds will support the completion of our missile test flights and the second production buy.

The Lance missile system, which was fielded in the mid-1970's, is the Army's answer to the requirement for early attack on second echelon enemy formations and for delivery of short to medium range nuclear fires. Lance can also deliver a conventional warhead containing some 1,000 lbs. of bomblets to a target located more than 70km away. Enemy logistics facilities, air defense sites, and commmunications centers are prime targets for this warhead. Because age will ultimately overtake the Lance, a follow-on, the Corps Support Weapon System (CSWS), is now being explored as a weapon for the 1990's. CSWS is envisioned as having conventional, nuclear, and chemical roles, with the capability of striking targets deeper and more accurately than Lance. It should overcome some of the Lance's other inherent disadvantages such as manpower intensity and a relatively slow rate of fire. The FY 83 budget contains a request to support the Army's Special Task Force, which is charged to evaluate CSWS alternatives and refine the requirement by 1983.

While we must be prepared for both nuclear and non nuclear contingencies, our first-response capability must be adequate conventional firepower. As enemy units advance, there may be critical periods when large numbers



Multiple Launch Rocket System

of targets threaten to overwhelm the capacity of tube artillery. When this happens, we must be able to strike deep with great accuracy and massive firepower, as well as be capable of attacking enemy units up to the forward edge of our troop positions with concentrated, responsive fire.

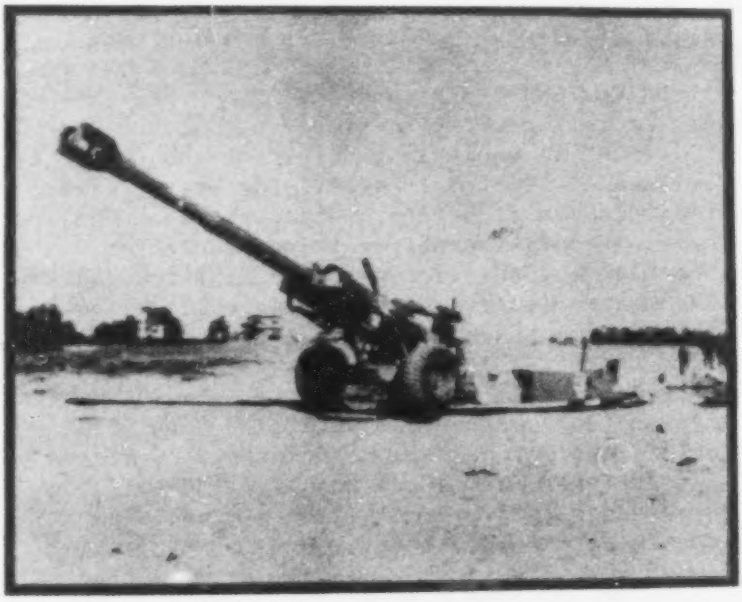
The Multiple Launch Rocket System (MLRS) is the system that fills this need. It will provide the Army with its first multiple rocket artillery capability since World War II. The MLRS rocket warheads contain a large number of improved conventional submunitions which are dispensed from the rocket high over the target and blanket the area with explosives and fragments. These submunitions are devastating against targets such as air defense sites, artillery positions, and troops in the open. The submunitions are also effective against the thin top armor of tanks and other fighting vehicles. The MLRS will be used primarily against concentrations of enemy vehicles, for counterfire against enemy artillery, and as an air defense suppression means.

The MLRS provides massive firepower. More than three 8-inch artillery battalions, firing simultaneously, would be required to deliver an equivalent number of submunitions as one launcher load of 12 MLRS rockets. The system also has incorporated a number of built-in efficiencies. The rockets are sealed in pods for shipment and require no maintenance after leaving the factory. The MLRS tracked carrier vehicle is a derivative of the infantry fighting vehicle and has the same power train and armor for crew protection. Although normally operated by a three-man crew, in an emergency one soldier can operate the entire system. Devices on the launcher can determine both location and direction, and an on-board computer unit computes fire commands, sets fuzes, and automatically aims the rockets. The passenger compartment also has a positive overpressure system for NBC protection.

The MLRS is being developed by the US in cooperation with Germany, France, and the United Kingdom. In conjunction with these allies, we are pursuing the development of a Terminal Guidance Warhead, TGW. This warhead enables the MLRS to attack hard point targets deep in the enemy's first echelon area in excess of 30 kilometers from the launcher. The concept calls for a rocket to fly to the kill zone, where the warhead will discharge guided submunitions that seek out and home in on enemy targets.

The Army is proud of the MLRS program. It is being managed within cost, schedule, and technical thresholds, and its competitive acquisition program is a well known success story. The FY 83 budget will complete the development phase, enable us to field our first systems, and begin the buildup to full production.

The M198, 155mm Towed Howitzer, which is now being fielded in light divisions and separate maneuver brigades, is our newest howitzer and is capable of firing 30 kilometers using a rocket assisted projectile. It provides major increases in range and reliability over its predecessor howitzers and may be parachute delivered or carried by a variety of cargo aircraft and the CH-47



M198

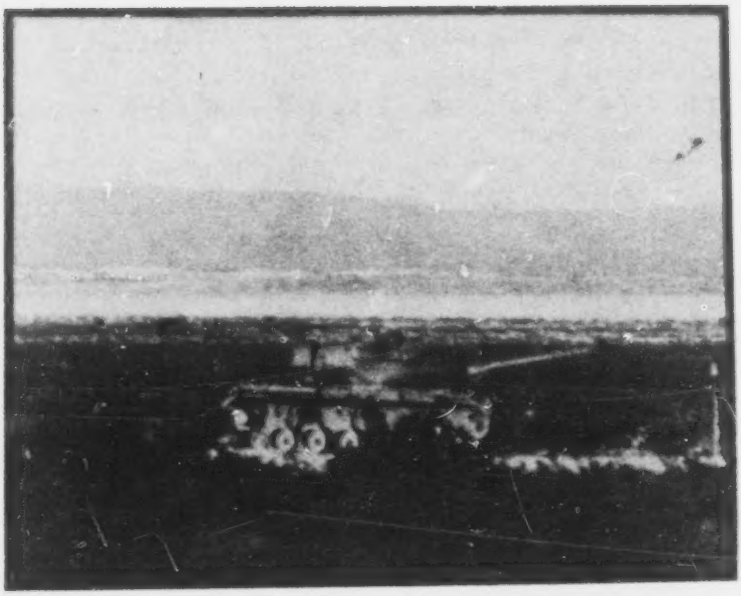
Helicopter. The M198, like our other howitzers, can fire scatterable mines, nuclear rounds, Improved Conventional Munitions (ICMs), conventional high explosives, and Copperhead. It will be a major improvement to firepower in the light part of our force. Although our budget does not contain M198 procurement for this FY, our long range plan forecasts additional procurements beginning in FY 84 and continuing into the early 1990's.

The mechanized and armored portion of our force structure have the M109 self-propelled 155mm howitzer and the M110 8-inch self-propelled howitzer. Both of these weapons date back to the 60's, but have been improved over the intervening years. We have extended the range of the 155mm howitzer to 24km and the range of the 8-inch howitzer to 29km by using rocket assisted projectiles.

The improvements we are making in our cannon artillery units will still leave us deficient in some ways vis-a-vis the Soviet artillery. If we are to gain an edge it must be on the qualitative side of the ledger. While there are still improvements that can be made to the howitzer in the areas of automatic position location, gun pointing and chemical protection, we are directing our technology efforts toward a munition modernization program which will significantly improve the firepower and support capabilities of these basic weapons.

Our first effort in this area was directed toward the development of a "smart" projectile that we named "Copperhead". Until the advent of Copperhead, the field artilleryman faced the statistical probability of wearing out his gun tube before hitting a moving tank. The addition of this laser-guided 155mm howitzer projectile into field artillery units has changed these odds dramatically.

Copperhead is fired using existing 155mm howitzers. It uses a built-in, semi-active laser seeker which makes it possible for the round to destroy stationary or moving armored targets, with a high single shot kill probability. As the projectile descends toward the intended target, its laser seeker searches for and acquires the reflections of a laser beam. This beam can be projected onto the target by an AHIP or APACHE or by a remotely piloted vehicle. The projectile corrects its course through the use of its fins as it "homes" to the laser spot on the target. Copperhead can hit targets at ranges up to 16km.

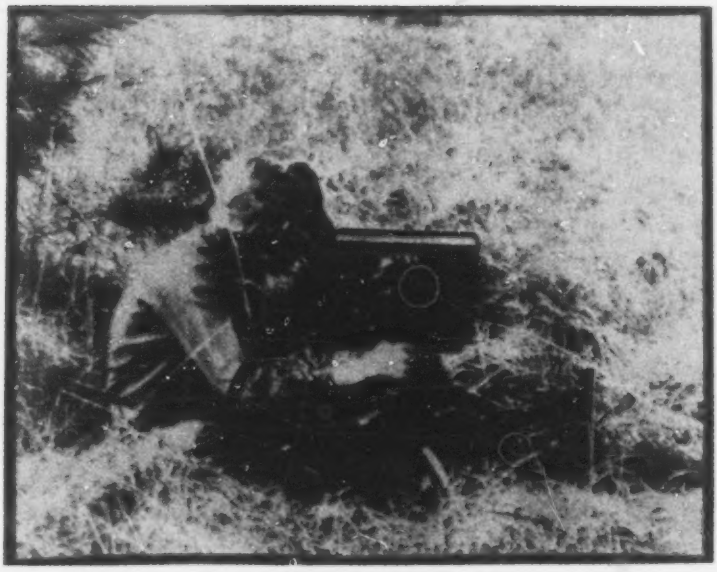


Copperhead

Copperhead will complement rather than replace conventional 155mm projectiles in artillery units. Copperhead is currently in production and will be fielded in 1982. The first artillery battalions to be equipped are assigned to the 24th Infantry Division (Mechanized), a unit of the Rapid Deployment Force.

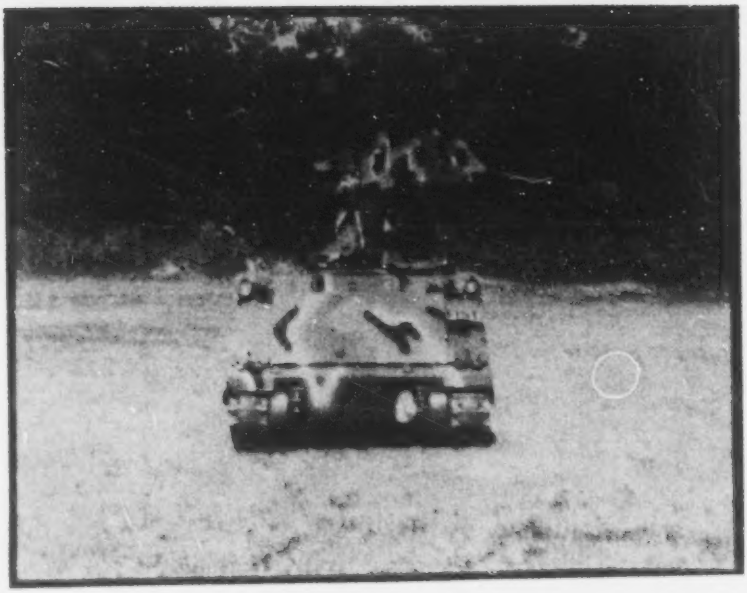
The FY 83 budget request will fund Copperhead production at an economic rate of 700 rounds per month. We intend to negotiate a fixed price contract with the prime contractor.

The other half of the Copperhead team is the Ground Laser Locator Designator (GLLD), which is used by artillery forward observers. This dual purpose device can be used by a forward observer to precisely determine target range and to illuminate targets for either the Copperhead or Hellfire missile. The GLLD will achieve its initial operational capability in April of this year and the FY 83 budget provides for continued procurement.



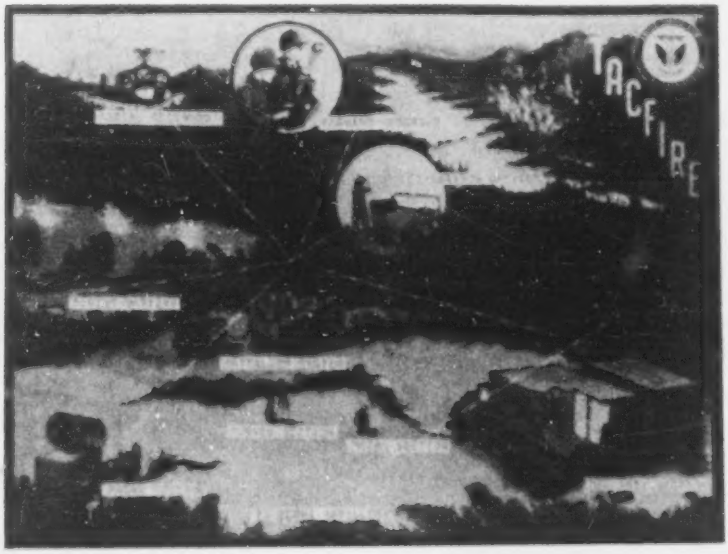
GLLD

The GLLD will provide the forward observer with an improved capability but it also places greater demands on him to transport and employ the equipment. Presently, the Fire Support Team (FIST) must dismount from its M113 armored personnel carrier or jeep to use the GLLD on a ground mounted tripod. The new Fire Support Team Vehicle (FISTV) will give the FIST armor protection, mobility, and built-in communications which will enable it to operate with fast moving armor, mechanized infantry, and cavalry units, and be responsive to the maneuver commander. The FISTV represents a combination of new laser technology with the proven performance of the M113. The vehicle is very similar in appearance to the improved TOW vehicle and incorporates the GLLD in an armored elevated module mounted on an M113 body. The FISTV is equipped with a north seeking gyro that provides the directional data needed for accurate artillery fire requests. It can operate in hull defilade with only the elevated GLLD module exposed, thereby increasing survivability. FY 83 funds will support completion of FISTV development.



FISTV

An awesome challenge to our artillerymen on today's battlefield is the effective management of the enhanced firepower capability we have been describing. Our tactical fire direction system (TACFIRE) provides an automated data processing system that makes rapid reaction and efficient engagement possible. Testing

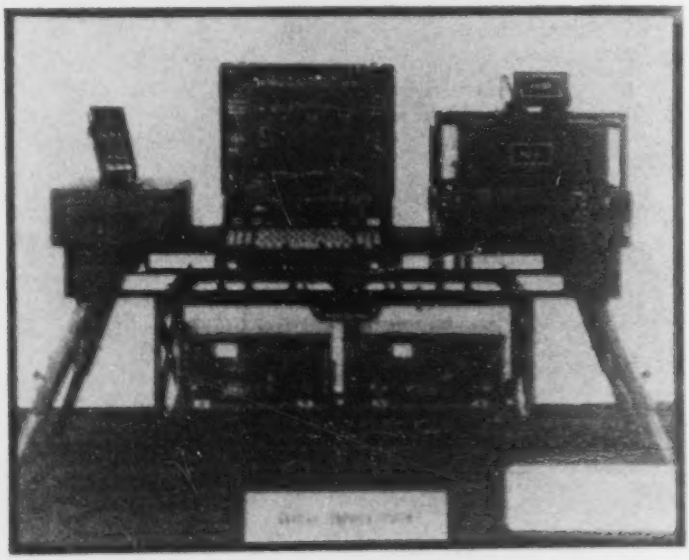


TACFIRE

has shown TACFIRE to be approximately twice as fast as the current manual system and more than ten times as effective when considering selection of munitions, volume of fire, and accuracy.

TACFIRE procurement has now been completed for the active forces. Fielding continued last year, with the 1st Infantry and 8th Infantry Divisions becoming operational TACFIRE units. In order to keep our command and control effective and efficient on future battlefields, we have begun development of the Advanced Field Artillery Tactical Data System (AFATDS). This system will use proven concepts from TACFIRE and take advantage of TACFIRE's modular design to develop an evolutionary follow-on system. FY 83 funds will be used to continue development of the Communication Control Subsystem, the first phase of the AFATDS system.

Overall artillery mission effectiveness will be significantly increased by improving operations at battery level as well. The Battery Computer System (BCS)



Battery Computer System

is a vehicular mounted, gunnery related computer system. It will replace the TACFIRE battery display unit and the obsolete Field Artillery Digital Automatic Computer (FADAC) in artillery batteries. The BCS provides firing data to

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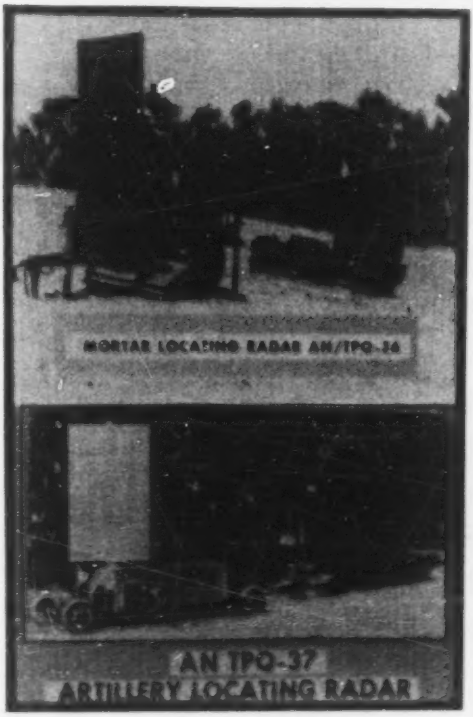
each individual weapon through an automatic digital link from the battery computer unit to the gun display units. The BCS performs ballistic computations for individual weapons and will interface with TACFIRE. It increases mission effectiveness by reducing response time, improves weapon effectiveness by providing individual weapon firing data, and increases battlefield survivability by enabling better use of terrain. The Army intends to acquire the BCS for both active and reserve forces. FY 82 funds completed the buy required to outfit the active force. FY 83 funds will begin procurement of BCS for Army National Guard and Reserve units.

Target acquisition within the fire support mission area is of equal importance to fire delivery and control systems. The FIREFINDER system consisting of AN/TPQ-36



mortar locating radar and AN/TPQ-37 artillery locating radar will give our soldiers the ability to automatically detect and locate enemy batteries in real time and to

attack them with timely and accurate counterbattery fire. Through interface with the TACFIRE system, radar location data can be sent to our guns before the first enemy round hits. The combination of these automatic counterbattery radars with the automated TACFIRE and BCS system is an excellent example of the complementary nature of our new systems. Such advances would not have been possible without a balanced research and development program.

FY 83 funds will complete the procurement of the AN/TPQ-37; procurement of the AN/TPQ-36 has already been completed.

The effective use of field artillery weapons depends upon accurate location, direction, and estimates of the influence of the atmosphere on artillery projectiles, rockets, and missiles as they travel to their targets. We now have automated systems to provide these data.

The Position and Azimuth Determination System (PADS) is an automated, self-contained inertial surveying system which will provide the field artillery with a secure, all-weather, day/night means for rapid survey control. Surveys that normally take the conventional 8-man surveying party several days can now be accomplished by a 2-man PADS party in a matter of a few hours. PADS will be fielded this year.

We need the new Meteorological Data System, MDS, to insure that artillery fires are adjusted to account for changing atmospheric conditions across a broad front. Greatly increased ranges of artillery projectiles will cause them to be exposed to atmospheric effects for increased periods of time. Reliable data are also required on how weather affects electronic warfare and battlefield obscurants employed by the enemy. In a "dirty battlefield" environment where anything from a severe storm to chemical or nuclear conditions can prevail, we must have timely meteorological data. The MDS will fill our needs by accurately measuring the atmospheric variations and automatically transmitting those variations to the TACFIRE and other automated systems that compute artillery firing commands. MDS uses a 6-man section, provides data hourly on an automated basis, and can collect data while on the move. FY 83 funds will be used to support testing and to initiate production.

Ammunition has been justly called the life blood of the artillery. In fact, it is essential to all elements of the combined arms force. Our ammunition

request provides for: Improvement of near term readiness, new munitions associated with modernization of Army forces, annual training needs, and a modest increase to sustainability. We also seek to modernize some existing World War II facilities, which are deteriorating, and provide the production capability for new ammunition items.

The field artillery has been alotted the largest portion of our resources for ammunition procurement. Major items in this category are 8-inch and 155mm Improved Conventional Munitions; 155mm Copperhead projectiles; 155mm Area Denial Munitions and Remote Anti-Armor mine system projectiles. Other significant categories include tank gun, small arms and mortar ammunition.

The munitions research and development programs cover all types of conventional munitions from exploratory development through engineering development. Major areas include technical base programs for large caliber munitions development and ballistics technology work applicable to all systems; development of modernized ammunition for the 105mm tank fleet and development of the German 120mm gun system for introduction on the Abrams tank in the mid 80's; field artillery munitions such as the Sense and Destroy Armor projectile--a top attack, anti-armor submunition, and numerous smaller projects for development of fuzes and propellants; and research and development of mine and countermine systems.

As a part of our modernization effort we are also looking at improvements in ammunition hauling and handling. We have developed and are ready to procure a Field Artillery Ammunition Support Vehicle (FAASV) which will be equal in mobility to the self-propelled howitzers in our inventory. The FAASV can resupply a howitzer that is under fire without exposing the crew or ammunition. The FAASV will ensure a more survivable force and will reduce greatly the man

FAASV

intensive ammunition handling function which presently takes place in a firing battery area. The FY 83 budget request will provide for the initial purchase of the FAASV.

AIR DEFENSE

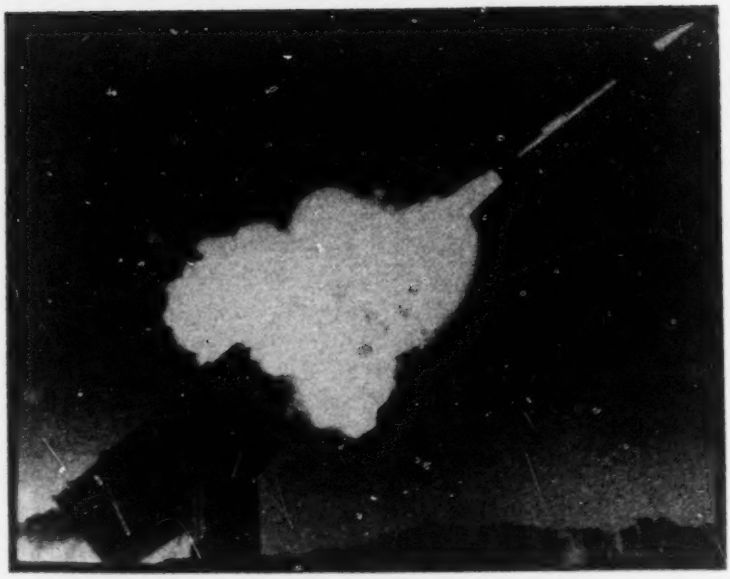
The Army's Air Defense mission area encompasses those activities involved with the detection and engagement of the enemy air threat with ground fire systems, in coordination with Air Force interceptor aircraft.

Without adequate Air Defense coverage, ground combat elements, supply lines, command centers, Air Force strike bases and other high value targets are exposed to destruction by fixed wing attack aircraft and attack helicopters. Pact forces have over 3,000 combat aircraft in Central Europe including bombers, fighters, and helicopters. Quality and quantity are on the rise. Ground attack aircraft such as FLOGGER, FENCER, Ground Support Fighter, and the HIND attack helicopter pose a deadly threat to armor and mechanized forces. The number of tactical ballistic missile and air launched missiles are increasing. Without the umbrella of air defense protection, the destruction of our ground combat forces and support elements is assured.

For many years our air defense needs have been served by Redeye, Vulcan, and Chaparral--the short range Air Defense systems, and the high to medium altitude Air Defense capability which includes I-HAWK and Nike-Hercules. The Army's air defense modernization plan will permit a mix of systems to be fielded that will be effective against the postulated air threat into the 1990's. In this section we will discuss our most capable air defense system, Patriot, first, and work our way down to the man-portable Stinger Air Defense Weapon.

In the future, we can expect to experience saturation raids by large numbers of sophisticated aircraft employing electronic countermeasures. Intense electronic jamming and limited firepower capabilities threaten the usefulness of our current systems, Nike-Hercules and HAWK. Therefore, we are fielding Patriot which can overcome the expected threat.

Patriot can simultaneously attack and destroy several enemy aircraft while tracking scores more. One of the main shortcomings of Hercules, which has been in the force since 1958, is that one battery can engage only one aircraft at a time. The operator has to wait until the missile goes all the way out to the target and detonates before firing another missile.



Patriot

Patriot employs a new guidance concept called Track-Via-Missile. As the missile reaches the area of enemy aircraft it informs the radar where it is in relation to the target. A computer than makes calculations and directs the missile on a path that insures a kill.

Despite its advanced technology, Patriot is operated with fewer soldiers than its predecessors. Each Patriot launching station contains four ready-to-fire missiles. The missiles are sealed in a canister that serves as both a shipping container and a launcher tube. They require very little maintenance. The Patriot system employs up to eight truck-mounted launchers that can be widely dispersed. Communication with the Engagement Control Station is made via secure data link.

Enemy targets can be tracked and prioritized for destruction through the interaction of Patriot's radar and computer. The radar can guide several missiles at the same time, updating priorities as threat aircraft simultaneously disappear from the screen and sky. Operating modes vary from manual mode to fully automatic mode. The system's two operators always retain full override capability over computer decisions.

The Patriot system is currently in production and is being considered for adoption by our NATO allies and the Government of Japan. The FY83 budget will support the procurement of additional fire units and support the fielding of the system which will continue through 1990. It is the world's finest air defense system and can defeat any aircraft in existence today or anticipated for development.

In FY83 the Army will initiate a new development program to counter the tactical surface-to-surface missile threat. The anti-tactical missile program will address near term improvements to existing air defense systems and new developments to counter the long term postulated tactical missile threat.

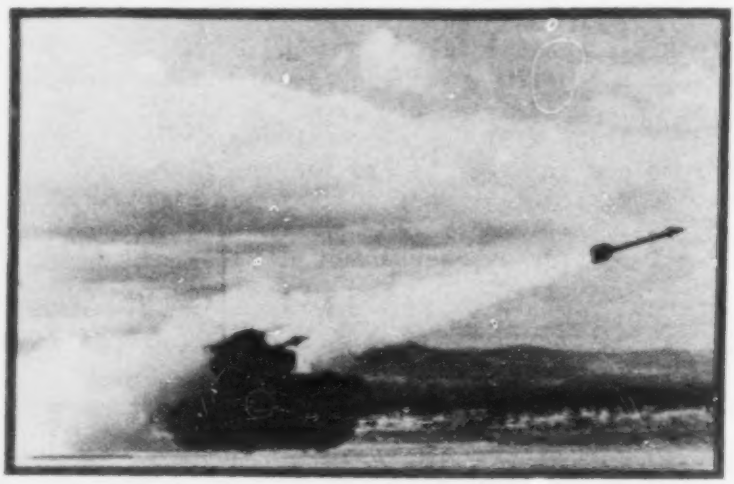
The mainstay of the Army's low to medium altitude air defense has been the Improved HAWK missile system (I-HAWK). I-HAWK will eventually be replaced by Patriot after it replaces Nike-Hercules. Ongoing and planned product improvements will significantly upgrade I-HAWK system performance to meet the projected threat of the 80's. The upgraded version will have a simultaneous engagement capability against close in saturation attackers, increased detection range, improved reliability, and greater effectiveness against jamming. Nineteen foreign countries have bought the system, and procurement interest has been expressed by several others. Part of

I-HAWK

this world-wide acceptance can be attributed to HAWK's showing in the 1973 Mid-East war, where, in its basic configuration, it downed more than 20 MIGS and other aircraft. The FY83 budget will fund the procurement of replacement rocket motors.

The US Roland air defense system had been planned for acquisition in order to fill the requirement for a day/night, all-weather, short range, air defense missile system. Because of affordability considerations, the US Roland program was terminated during the development of the FY83 budget request. In order to gain some return on prior investments in Roland, and to improve the air defense capability of the Rapid Deployment Force, the program was restructured to field a CONUS-based 27 fire unit light battalion. The FY83 request for $60 million completes and closes out the restructured "light battalion" program.

Chaparral is the Army's short range air defense missile system. It is effective against all types of aircraft at low altitudes and we are modifying it to improve its capability. With the termination of the Roland program, improvements to Chaparral in order to extend its operational life became even more important.



Chaparral

Chaparral is visually directed. We are procuring Forward Looking Infrared (FLIR) modules to allow the operator to see targets at night and in poor weather conditions. The FLIR presents to the gunner a black and white TV-like presentation based on infrared emissions from the target. Smokeless rocket motors have also been developed to replace the current motors which leave a highly visible trail of smoke. An Identification Friend

or Foe (IFF) device is being installed on each fire unit to assist the gunner in identifying friendly aircraft. We are also continuing R&D work on a Passive Optical Seeker Technique (POST) guidance system to keep Chaparral effective against targets using countermeasures. FY83 funding supports the continued development and procurement of these Chaparral improvements.

Short Range Air Defense Command and Control (SHORAD C^2) is being developed to allow more effective utilization of the short range air defense weapons. This C^2 effort focuses on improving the probability of successful engagement of hostile targets, increasing our capability for aircraft identification, and insuring timely dissemination of C^2 information.

The present SHORAD method of accomplishing command and control is purely manual. Information from the sensors of the High-to-Medium Altitude Air Defense community is provided through voice communications. This information is received at a central control facility at the SHORAD battalion where it is manually plotted and retransmitted by voice to the appropriate maneuver elements. This method is time-consuming and limits the number of aircraft that can be engaged at one time.

The SHORAD C^2 development will automate this process and enable us to successfully engage the air threat we anticipate within the division airspace. Computer processors and data links will replace most human actions and voice communications in order to provide the fire units with the required engagement data quickly and simply. In FY83 the Army will complete the concept definition phase of SHORAD C^2 and provide a request for proposal to industry for further development.

In order for our forward ground combat forces to survive Soviet air attack, we require a quick reaction air defense system with mobility and armor protection comparable to that of our mechanized and armored close combat units. The Division Air Defense (DIVAD) gun system meets that requirement.

The present 20mm Vulcan System cannot provide adequate protection to rapidly moving armored and mechanized forces. With its longer range, larger caliber gun, armor protection, and full-tracked mobility, DIVAD will be able to defeat both low-flying fixed wing aircraft and helicopters. Attack

DIVAD

helicopters--firing anti-tank guided missiles--pose a threat to our forward maneuver forces which is growing quantitatively and qualitatively every year. The DIVAD gun is the only ground air defense system specifically designed to counter this threat. Its advanced radars detect aircraft and helicopters and automatically provide the location data for aiming the gun to the onboard digital computer, providing the rapid reaction capability necessary to counter the threat. The DIVAD system fires 40mm high-explosive, point detonating or proximity fuzed ammunition. In addition to its air defense role, DIVAD can also be fired, in self-defense, to destroy lightly armored combat vehicles.

The DIVAD gun development program is worthy of special mention. A competitive development was conducted between contractors employing existing European cannons and US fire control systems. The chassis employed in the competition was taken from a modified M48A5 tank. The result has been a less costly, more effective system delivered in a very timely manner. FY83 funding will procure 96 DIVAD gun systems and the ammunition to support them.

Stinger is the Army's man-portable air defense missile system. It provides air defense protection for forward deployed ground combat units. Stinger was developed to replace the aging Redeye system which was first fielded in the mid-1960's, and which has limitations when matched against the current and projected enemy air threat.

Stinger

Stinger overcomes many of Redeye's shortcomings with improved range and maneuverability, the ability to attack much faster targets, and, most importantly, the ability to attack aircraft from any angle. The missile uses a passive infrared seeker that homes on the exhaust plume of a target. A proportional navigation system enables the Stinger to fly an intercept course to the target. The high explosive warhead is designed to penetrate the aircraft before exploding so as to insure a kill. These capabilities provide an enormous advantage over the Redeye system which is a "revenge" or tail chase system only.

Stinger was designed with growth potential in mind and an improved Stinger seeker, Stinger-POST, is under development. This seeker will improve Stinger performance in a countermeasures environment. The Stinger missile was initially deployed to active Army units in Europe in

February 1981. Stinger-POST development is scheduled for completion this fiscal year. FY83 funding will complete the procurement of Basic Stinger and will begin production of Stinger-POST.

The importance of getting our new air defense systems to the field cannot be overemphasized. They will provide great improvements in capability as well as reducing our defense manpower requirements.

COMBAT SUPPORT

The Combat Support mission area includes those systems designed to provide operational support to the soldiers in the combat area. Included in this mission area are engineer support to include mine and countermine operations, support of combat operations in a nuclear and chemical environment, the conduct of electronic warfare operations and the provision of tactical intelligence to support combat operations.

We are well acquainted with the Soviet use of massed armor and the formidable threat it poses to our forces. Minefields, obstacles, and protective barriers are several means of making the enemy's job difficult. Mines can destroy the first few tanks spearheading an attack and cause disruption and delay in the enemy's advance or deny him access to planned avenues of approach. If the enemy commander decides to halt and clear a path through the mine field, he must compress his formation and expose himself to our concentrated anti-tank and artillery fires. If he attempts to run through the minefield, he will pay a heavy price in tanks. Finally, avoiding the minefield costs him time and may well force him to maneuver his force into our preselected kill zone or into disadvantageous terrain.

On a fluid, rapidly-changing battlefield, it is imperative that minefields be emplaced expeditiously. In the past, the emplacement of mines was a slow and laborious process and mines had to be emplaced long before the enemy commander had declared his intentions. The new family of scatterable mines changes this situation. The Ground Emplaced Mine Scattering System (GEMSS) will enable us to lay large minefields in a comparatively short time span. GEMSS, a trailer mounted system with a capacity of 800 mines, dispenses at a preselected rate to provide the minefield density required. This capability can be best appreciated by comparing the system with the older mines and dispensers in our inventory. Using the older systems it would take 50 hours to lay a 2500 meter anti-tank minefield and require 46 5-ton

GEMSS

truckloads of mines. GEMSS can lay a more effective minefield in 3 hours and requires only three 5-ton truckloads of mines to do it. The GEMSS mines weigh 4 pounds each and are as capable of destroying a tank as the old 30 pound blast mines that are still in the inventory. GEMSS is now in production and the FY 83 budget request will provide for procurement of 12,000 anti-personnel and 55,000 anti-tank mines.

Another key element in the defense is the positioning of our armored vehicles in hull defilade which, in conjunction with the use of obstacles such as minefields and tank ditches, greatly increases the combat effectiveness of our forces. In a properly prepared hull defilade position, only the turret of the tank or fighting vehicle is exposed. The limited profile reduces the probability of identification as a target by an attacking enemy ground force and compounds the difficulty of an enemy force to engage and kill a defending system.

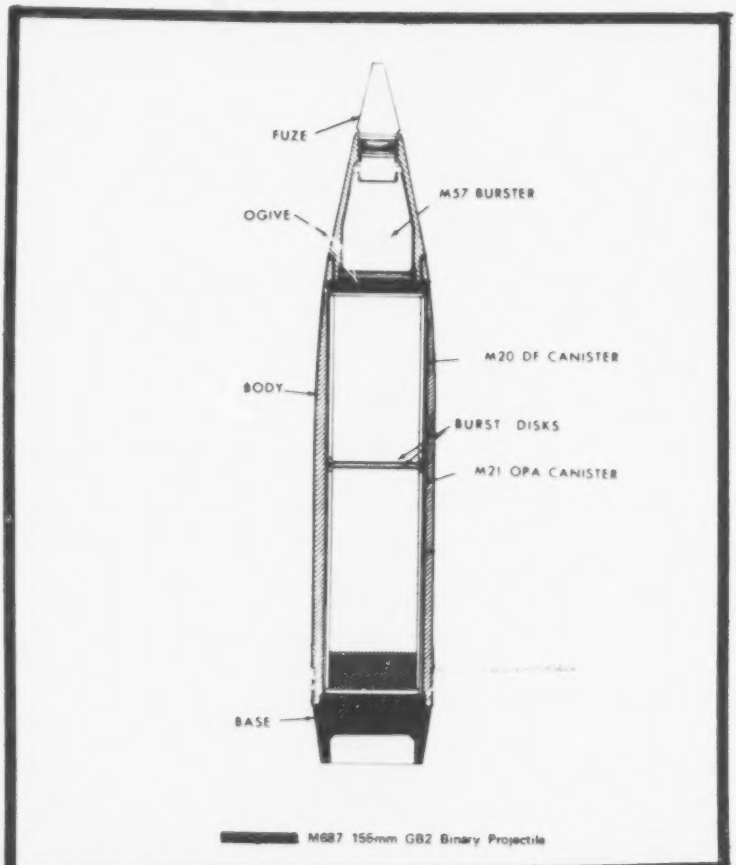
The Army needs the capability to dig hull defilade fighting positions for its tanks and fighting vehicles when and where required by the maneuver force in the fast moving environment of the active defense. The M-9, Armored Combat Earthmover, is uniquely designed to fill this need; it has the speed and mobility to keep pace with the combined arms force, the armor protection to survive on the modern battlefield, and the ability to dig in tanks and fighting vehicles rapidly.

Chemical warfare may very well be the Army's most vulnerable area in the 1980's. Even though the US is formally committed to the policy of "no first use" of lethal or incapacitating chemical agents by adherence to the Geneva Protocol of 1925, and seeks a complete and verifiable ban of lethal chemical weapons, the threat still exists. Today, US forces are facing a chemical threat from an adversary which is the best prepared and trained nation in the world in the use of chemical warfare. Without question, the Soviet Union possesses a formidable offensive capability to wage chemical warfare for an extended period, and their leadership continues to devote significant resources to research, development, and procurement of more advanced chemical weapons and equipment. They also have a large and well-equipped dedicated chemical force, and all units within their armies train extensively for chemical warfare, including the use of live agents in training.

Given the disparity between US and Soviet chemical warfare capabilities and signs of Soviet use of chemical warfare directly or through surrogates, we must promptly modernize our own retaliatory capability. The US currently has a limited stockpile of chemical munitions. All of these munitions are of the unitary design, that is they contain the actual agent in its final form. These munitions are also aging--some date back to World War II--and are costly to store, maintain in a usable status, and transport in a safe manner. Additionally, the stockpile is composed of weapons and agents that are inadequate. The best option for developing and insuring a credible retaliatory stockpile in support of the national policy of deterrence is binary modernization. (The binary concept uses two non toxic chemical components that combine in flight to the target to form a lethal chemical nerve agent.) In addition to the added safety afforded by binary munitions during

production, storage, and movement, binary modernization would allow the optimum weapon and agent mix. Accordingly, an intensive R&D effort is underway to improve binary technology for application to both artillery munitions and rocket and missile warheads.

The Congress, recognizing the need to modernize the chemical weapons stockpile, appropriated $23.15 million in FY 81 for construction and facilitization of the Integrated Binary Production Facility at Pine Bluff Arsenal, Arkansas for production of the 155mm GB-2 (non persistent) artillery round. Initial construction began in October 1981. The FY 83 funding to begin procurement of the 155mm GB-2 round will require Presidential certification that production is necessary in the interest of national security. Research continues on improved agents with an objective of developing munitions for the 8-inch howitzer, and Multiple Launch Rocket System.



At the same time, we must continue the procurement of additional chemical protective equipment in FY 83 to improve the ability of our forces to survive an initial

chemical attack. Additional procurement and research and development is required before we can sustain combat operations in a chemically contaminated environment. Additional quantities of the fielded protective masks will be procured to provide adequate individual respiratory protection for each soldier. Also, collective protection systems are being integrated into our command, control, and communication and combat vehicles.

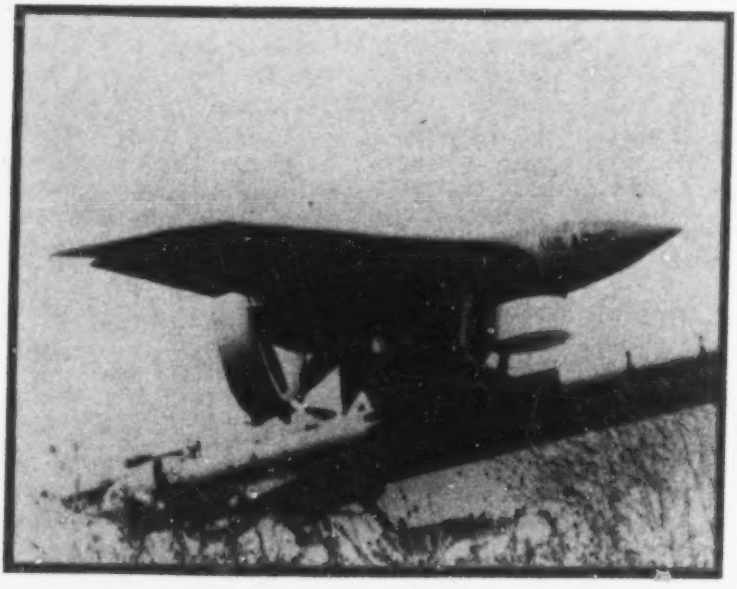
The FY 83 Chemical program expands our efforts with academe and industry to broaden the technology base required to support materiel needs. Development is scheduled to be completed on a new protective mask and a biological detection and warning system. Development will continue on an aviation respirator system, numerous items of collective protection equipment for shelters, vans and tactical armored vehicles. In the chemical agent detection and alarms area, development will contnue on a remote sensing alarm, a detector kit for chemical agents in water, an automatic liquid agent alarm, an alarm training simulator, and a chemical attack warning and transmission system. Work will also continue on decontamination systems for clothing and a rapid decontamination system for tactical vehicles.

As with our chemical munitions, a modernization program is underway to replace or upgrade the Army's short range theater nuclear forces. Currently fielded Army systems, with the exception of Lance, are experiencing a decline in reliability because of age and attendant parts failure, and are deficient in terms of operational utility and command, control, and security features. High priority systems are being replaced; lower priority systems will be product improved. On track and within cost and time schedules is a modern eight inch nuclear projectile procurement program. The new eight inch warhead, which has an enhanced radiation capability, is replacing the currently fielded mid 1950's vintage M422 nuclear projectile. The Army is also procuring an enhanced radiation capable warhead for the Lance missile system. These enhanced warheads are being stockpiled on US territory in accordance with President Reagan's production decision.

Determining the exact location of the enemy's combat power is important on any battlefield, but it is absolutely essential where the enemy is superior in manpower and hardware. Combat support also includes providing tactical commanders with intelligence and information to support the planning and conduct of combat operations.

Historically, a ground commander's greatest shortcoming has been the lack of information concerning the enemy's location, disposition, and intentions. In past conflicts we have relied upon a number of ways to obtain information about the enemy. The most reliable sources were usually agents planted behind the lines or reconnaissance patrols that penetrated enemy lines at great personal risk. Often, when these sources obtained information, they were unable to communicate it to their superiors. Thus, the high personal risks that they assumed had no payoff.

With the introduction of the Remotely Piloted Vehicle (RPV), a relatively small, propellor driven, remotely controlled aircraft, we have the potential to remedy this shortcoming. The Remotely Piloted Vehicle has the capability to fulfill several important battlefield functions. It is designed to fly into hostile territory and locate targets, adjust artillery fire and laser designate targets



Remotely Piloted Vehicle

for destruction by laser-seeking artillery or missiles. It can also perform reconnaissance, damage assessment, and other functions. The RPV carries a small television camera and a laser designator. In its later version, a

a Forward Looking Infrared (FLIR) night vision sensor will be added. From the relative safety of a rear area, the controller need only place the crosshairs on a target which is visible on his TV screen and activate a switch in order to have the RPV laser designate the target. As with the GLLD laser designator, the Copperhead or Hellfire Missile can then be fired into the general vicinity of the target and home in on the laser spot. The compatibility of the RPV with the Copperhead and the Hellfire missile system illustrates how we have designed our new equipment to work together on the battlefield.

Reconnaissance will be another high-priority function of the RPV. The RPV can fly above a key enemy zone in order to gain required data when the defense strength of the enemy is likely to make manned reconnaissance extremely risky. Small RPVs, which are difficult to track and hit, will allow us to fly reconnaissance missions without risking pilots or valuable aircraft. FY83 funds will support continuation of contractor flight tests and the fabrication of full scale development hardware.

The Army's critical requirement for near realtime surveillance and target acquisition behind the enemy's front line will be addressed in a new program that we are calling the Battlefield Data System (BDS). This capability is urgently needed, if we are to win the air-land battle. The recently-terminated SOTAS program offered an outstanding potential for collecting this information about the enemy, but became too expensive. We appreciate your recognition of the urgent requirement for a SOTAS-like capability. We will continue to pursue an affordable way to provide that capability to our field commanders. In order to hold down costs for the BDS program, we will strive to make good use of applicable technology already developed for SOTAS. We are also working with OSD and the Navy to identify other systems or technology which should be identified. Our FY83 budget request for BDS supports that objective.

Offensive electronic warfare operations are calculated to disrupt enemy command, control, and communications capabilities. This is an area where the Soviets may be vulnerable because of their rigid hierarchal structure. In this system, the Soviet soldier depends almost exclusively on orders before acting. This lack of individual resourcefulness may well prove the Achilles' heel of the Soviet Army if we can impede the orders which flow from Soviet command headquarters. Every unit is tied by an electronic apron

string to its next higher echelon. Disrupting the Soviet's communications network by means of electronic warfare may be a key means of slowing a Warsaw Pact attack, and thereby making it vulnerable to eventual defeat.

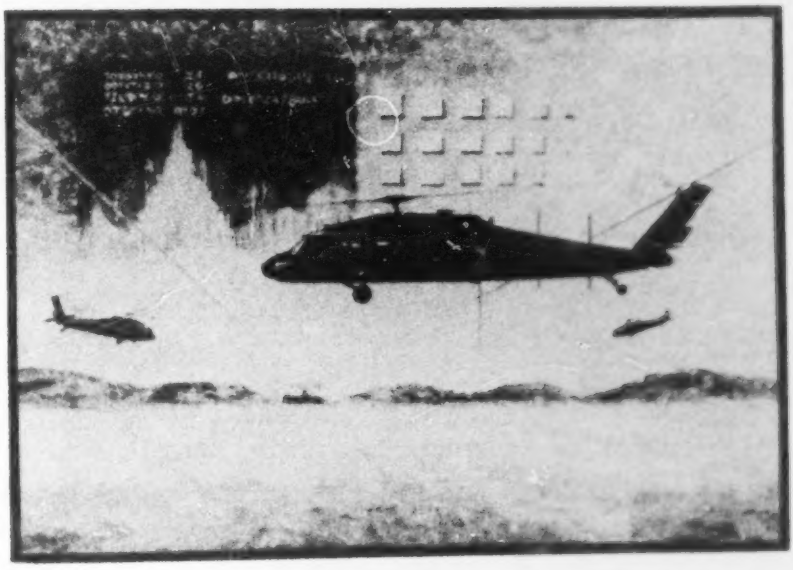
Before a commander can employ electronic countermeasures, he must understand the enemy's use of electronic systems. He must see these systems as a target array and understand the relative importance of each enemy net or weapon system using electronic emitters. Programs to enhance a commander's capability to obtain this type of information are extensive and varied. Some items such as the TEAMPACK and TRAILBLAZER are ground-based radar and communications intercept systems currently being fielded. Others such as the QUICK LOOK and GUARDRAIL, are airborne signals intercept systems which, though fielded, are being upgraded through product improvements.

GUARDRAIL

GUARDRAIL V is a combined airborne sensor and ground processing facility communication intelligence system with proven ability to provide near realtime data on the location of enemy electronic emitters. The airborne sensor is carried

in the RU-21H aircraft. GUARDRAIL, however, has some limitation. Thus, we are continuing the procurement of the Improved GUARDRAIL (RC-12D), a system that overcomes those limitations.

QUICK FIX is an airborne offensive communications intercept and jamming system that will deny the enemy the use of his radios during key periods of battle.



QUICK FIX

The QUICK FIX System is capable of intercepting and jamming enemy communications. QUICK FIX is designed to operate against air defense units and maneuver units. QUICK FIX I is currently flown on a modified EH-1H aircraft. Future QUICK FIX II systems will be mounted in the EH-60A BLACKHWAK aircraft. Our R&D request this year for QUICK FIX II is to complete development for the prototype EH-60A aircraft.

QUICK LOOK

QUICK LOOK II is an airborne computer controlled system mounted on a MOHAWK aircraft that detects, locates, and identifies enemy radars. It provides tactical field commanders with timely data on enemy missiles, artillery, and anti-aircraft weapons. The FY 83 budget contains funds for product improvements to the aircraft and mission systems.

After the commander has identified the location of enemy electronic emitters, he can then utilize his jamming assets.

In the area of ground based jammers, our combat electronic warfare intelligence (CEWI) units will be equipped with the medium power AN/TLQ-17A ground based jammer and the high power expendable jammers in development that are designed for hand and remotely piloted vehicle emplacement or to be encased in artillery projectiles. Additionally, the Army is equipping CEWI units with the standard VHF radio electronic countermeasures set, AN/VLQ-4. This device allows us to use our AN/VRC-12 series tactical radio to jam the enemy and provides an ECM training device for both the active and reserve forces. The FY 83 budget will support the continued development and acquisition of electronic countermeasures capabilities to active units and forward deployed organizations.

COMBAT SERVICE SUPPORT

The Combat Service Support major mission area is an aggregation of mission areas related to providing staying power to the combat force and the maintenance and support of weapons systems, support systems, their operators and crews. In this section we will discuss both air and ground mobility systems including the Black Hawk helicopter, our largest cargo trucks, our commercially adapted utility vehicles and finally our armored recovery vehicle.

In the initial stages of most potential conflicts, we can expect to fight outnumbered and outgunned. Therefore, the commander must have the ability to move forces rapidly about the battlefield in order to optimize their overall effectiveness and to avoid decisive engagements with forces having superior strength. The key to this capability is enhanced mobility, both air and ground, which enables us to position our forces in the right place at the right time.

The Black Hawk helicopter, the high end of the high-low utility helicopter mix, will perform air assault, air cavalry and aeromedical evacuation missions and answers the Army's need for improved battlefield mobility. Its predecessor, the UH-1, is an excellent and reliable helicopter, but is so power-limited that during hot weather and in high altitude conditions, its payload is greatly reduced. Furthermore, in Vietnam the UH-1 proved to be extremely vulnerable to small arms ground fire.

Black Hawk

Black Hawk is clearly superior to the UH-1. It can carry more than twice the UH-1 payload and can transport a complete, fully equipped, squad 42 knots faster in all weather and altitude conditions. Black Hawk also adds significantly to the mobility of division artillery. It is our first utility helicopter with sufficient capability to reposition a 105 mm howitzer, its crew of six, and up to 30 rounds of ammunition in a single lift.

The critical components in the Black Hawk are armored or redundant to enable it to withstand multiple small arms hits. It is invulnerable to the 7.62 mm armor piercing round and tests have demonstrated its ability to continue flight for a minimum of 30 minutes after sustaining damage from projectiles as large as the 23 mm high explosive incendiary round. The airframe is designed to absorb impact forces by progressively deforming on impact, thereby protecting the crew in a crash.

Black Hawk

Black Hawk fielding for the 101st Airborne Division, the 82d Airborne Division, the 9th Infantry Division and the 24th Mechanized Division is complete. Initial fielding for our units in Europe begins in mid-1982. The FY83 budget request supports a stabilized production rate for Army needs at 96 aircraft per year.

Another element of the Army's Combat Service Support mobility team is the CH-47 Chinook. This aircraft, the Army's only medium lift helicopter, was designed in the 1950's and fielded in 1962. Its primary missions include the tactical movement of artillery, troops and special weapons on the battlefield as well as the movement of ammunition, repair parts, and petroleum.

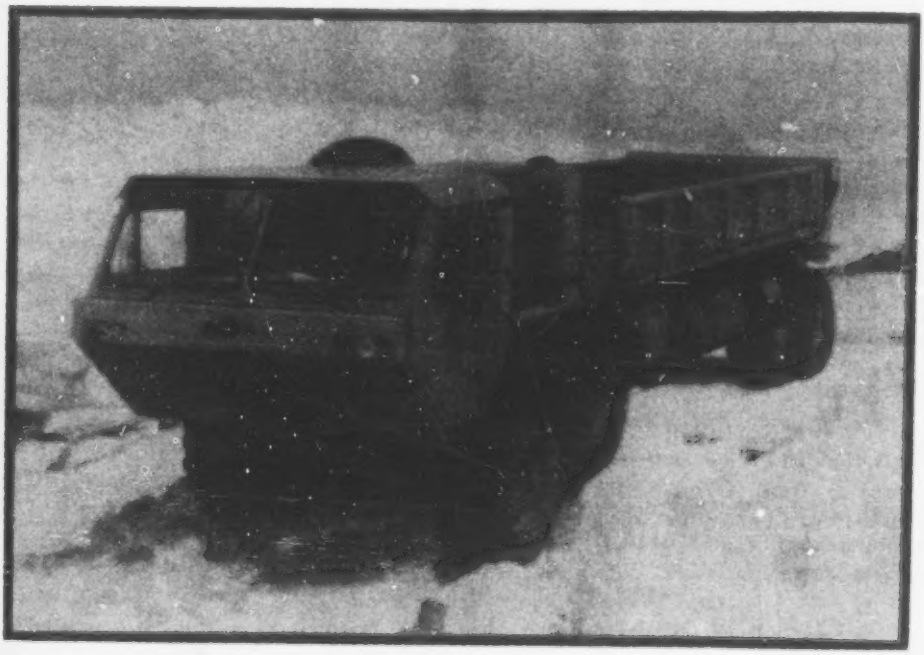
We intend to extend its useful life beyond the year 2000 by an extensive modernization program. The active Chinook fleet is being substantially upgraded. Modifications are all-encompassing, but the cost is significantly less than an all new aircraft would have been.

CH-47D

The first production CH-47D will be delivered to the Army in April of this year. FY83 funding will procure 24 additional aircraft. This program has been accelerated to achieve a more economical production rate and will be stabilized at a rate of 60 aircraft per year beginning in 1986. This acceleration will cause the procurement to be completed four years earlier than we had originally planned and will reduce overall program cost.

While helicopters are essential to rapid mobility and resupply of the Army, tactical wheeled vehicles have been and will remain the backbone of our logistical system. Today, shortages of trucks exist in vital combat support areas. Furthermore, the requirements posed by new weapons systems such as Pershing II, Patriot, and the Multiple Launch Rocket System require additional trucks for transport of ammunition, fuel and other support items. Trucks are essential to make these modern weapons work.

Heading the list of workhorses is the 5-Ton Truck. It will support the introduction of such major systems as Firefinder, Patriot, Pershing II, and TACFIRE, as well as meet ammunition and general cargo transport and other special purpose needs. In FY81, a competitively awarded five-year multi-year contract was signed with AM General Corporation for 11,394 improved 5-Ton Trucks with an



HEMTT

option to increase production by 100%. In addition to meeting critical Army requirements such as meeting shortages and replacing overage vehicles, the procurement also provides vehicles for the Marine Corps and Air Force. In FY83 we will continue to acquire vehicles under the contract signed in April 1981.

The Army 10-Ton Truck requirement is being met by two vehicles. The 10-Ton Heavy Expanded Mobility Tactical Truck (HEMTT) program features an assemblage of commercially proven components. A competitively awarded five-year multiyear contract was signed with Oshkosh Truck Corporation in FY81 for 2,140 HEMTT's with an option to increase the quantities by up to 250%. The HEMTT will meet high priority systems requirements such as Multiple Launch Rocket System and unit ammunition and fuel transport requirements. In FY83 we will continue to acquire vehicles under the contract that was signed in May 1981.

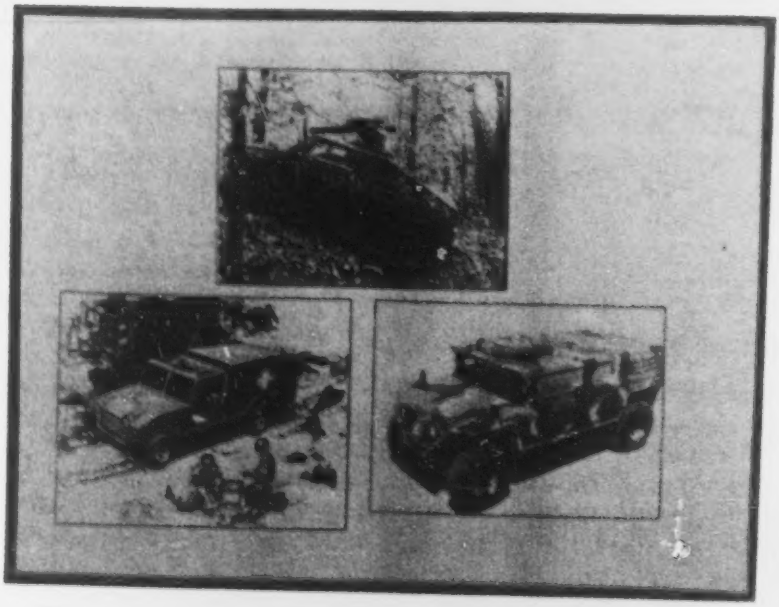
The other portion of the 10-Ton Truck requirement will be met by the M.A.N. truck. The vehicle is being procured to meet urgent requirements for Ground Launched Cruise Missile (GLCM) and Pershing II (PII). The contract was awarded in October 1980. In FY81 the first 15 vehicles were delivered for initial production testing and the initiation of weapons systems testing. In FY83 additional vehicles will be acquired under the contract option to support the fielding of PII and GLCM.

The heavy duty tactical wheeled vehicles are well suited for transport of heavy cargo, fuel and ammunition, but it would be neither economical nor efficient to use them as utility trucks or to carry light cargo. Such light load requirements dictate the need for utility vehicles. Presently, that need is satisfied by the M880, commercial, "pick-up" truck, series of vehicles and to some extent by the M151 1/4 ton "jeep". This light load or 5/4 ton payload requirement will be met in the future by two vehicle families. The first vehicle family is the Commercial Utility and Cargo Vehicle (CUCV) which will serve the needs of the Army, Marine Corps, and Air Force.

As with the M880 series, which the CUCV will replace, the CUCV will be a family of commercially available, off-the-shelf vehicles. It will consist of cargo, utility, and ambulance versions and will be a four-wheel drive vehicle in the 5/4 ton payload category for use on primary and secondary roads with cross-country capability.

Procurement of the CUCV will also comply with Congressional direction to commercialize at least 20% of the M151 1/4 ton "jeep" fleet. The FY83 budget will support the second year of a planned multiyear procurement.

The other vehicle family in the 5/4 ton payload category, which is complementary to the CUCV, is the High Mobility Multi-purpose Wheeled Vehicle (HMMWV). The HMMWV is a 5/4 ton payload, four-wheel drive tactical vehicle that uses a common chassis with three body configurations: weapons carrier, utility, and ambulance. Emphasizing the use of commercially available components, the HMMWV will have excellent on and off road capability with a range of 300 miles and a maximum speed of 60 miles per hour. This vehicle will replace aging and obsolescent vehicles in the light tactical fleet: the M561 CAMA GOAT, the M274 MULE, and selectively, the M151 1/4 ton utility vehicle. It will also serve as a TOW and Stinger missile carrier and will perform in forward observer, forward air control and other battlefield roles. This vehicle may well be one of our most important assets as we move toward lighter divisions. The HMMWV program will also meet tri-service needs providing vehicles for the Army, Marine Corps, and the Air Force.

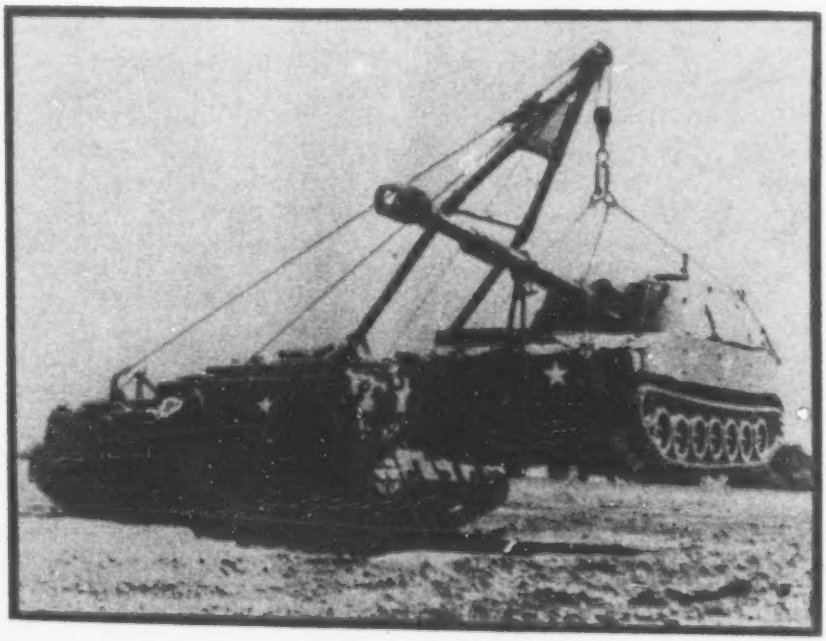


HMMWV

In July 1981, development contracts were awarded on a competitive basis to three manufacturers for fabrication of prototypes: Teledyne Continental Motors, AM General Corporation, and Chrysler Defense, Incorporated. Each contractor will be required to deliver 11 prototypes for competitive development testing/operational testing in 1982. The vehicle that best meets the needs of the services will be procured. FY83 funding will allow us to complete the HMMWV research and development program and award a five-year multiyear contract for production of the vehicles.

We are pleased with the strategy of multiyear acquisition programs awarded for the 5-ton and HEMTT and proposed for CUCV and HMMWV vehicles programs and believe that they will be highly successful. One factor that contributes immeasurably to the attractiveness of these programs is the increased quantity that accrues when the services pool their requirements and agree to commonality of the truck fleet.

Accordingly, we are able to drive a better bargain with industry in a competitive environment and secure reasonable guarantees for quality, price and schedule requirements. Such programs are attractive to industry because it can plan for several years of business rather than one year at a time. These considerations will foster private investment which will enable higher productivity and a stronger industrial base. Our challenge for the future is to maintain the stability of our program funding.



Rounding out our combat service support transport requirements is the M88A1 recovery vehicle, which supports the mechanized and armored combat soldier by recovering disabled tanks and other combat vehicles from the battlefield. In the 1973 Middle East war, the Israeli Army demonstrated the importance of this capability by quickly recovering, repairing, and sending tanks back into battle against a quantitatively superior enemy. This accomplishment was key to the Israeli success. Fielding of the M88A1 was initiated in 1977. A recent depot program to overhaul 863 gasoline engine driven M88's and to convert them to diesel power is very close to completion. The FY83 budget will fund the procurement of an additional 180 of these badly needed recovery vehicles.

Trucks and our other logistical equipment give our soldiers the vital support needed to fight successfully in sustained conflicts, and merit your continued support.

Now that we have reviewed the mission areas that put combat power on the battlefield and sustain it in battle, we shall turn to the mission area that is essential for orderly execution of all battlefield missions--Command, Control, and Communications.

COMMAND, CONTROL, AND COMMUNICATIONS (C^3)

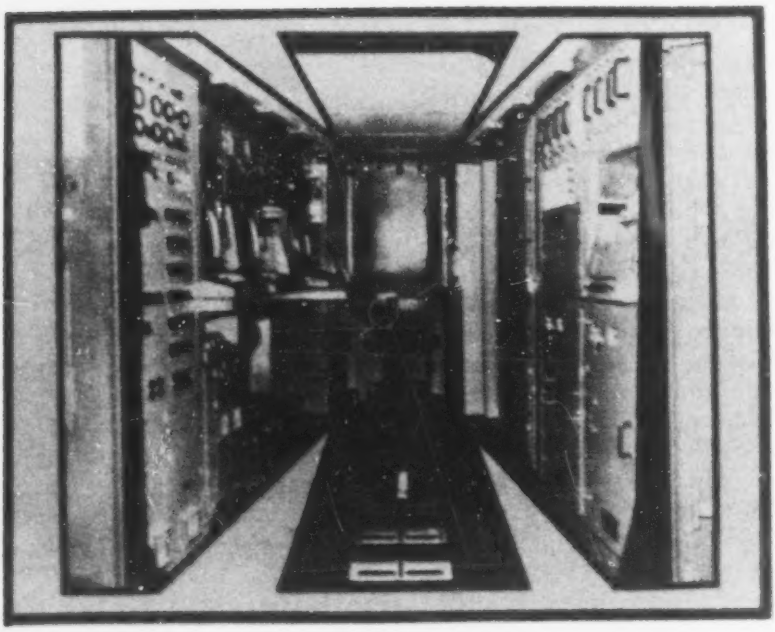
The activities covered by the C^3 mission area, the command and control of our forces and the communications which make it possible, are the keys to success on the battlefield. The C^3 function is analogous to the central nervous system of the body. The weapons and support systems discussed earlier are similar to muscles which react only on command and which function effectively only when they are controlled and coordinated. The systems discussed in the C^3 mission area provide the means by which we control, direct, and coordinate our forces. The importance of these systems cannot be overstated.

The C^3 mission area encompasses a staggering variety of demands and challenges. The demands range from a derivative of the Presidential "Hot Line," capable of transmitting the Presidential release orders to nuclear capable units, down to a simple squad radio capable of functioning under the rigors of combat. The challenges relate to an almost unbelievable number of conditions and complications: C^3 systems are affected by natural and man made phenomena, they are subject to enemy jamming and intercept, they must be compatible with fixed sites in peacetime and with mobile carriers during hostilities, and they must be adaptable to special interfaces related to our sister services and NATO Allies.

Communications is a field in which the US possesses a degree of technological expertise that is the envy of the world; however, due to affordability constraints, the Army's fielded equipment did not keep pace with this technology during the 1970's. We plan to close this gap during the decade of the 1980's as we move from an era of grease pencils and manual switchboards to one in which the Army's entire C^3 network will be modernized.

The first system we would like to cover is the Joint Tactical Communications (TRI-TAC) program, a Joint Service and DOD Agency program to develop and field future tactical multichannel switched communications. The broad goals of the TRI-TAC programs are to achieve interoperability between Army and other DOD telecommunications systems, provide new equipment which reflects the most recent technology, to eliminate duplication among the Services, and enhance interoperability with NATO systems.

The TRI-TAC family of equipment consists of digital telephone and message switches, secure and non-secure phones, subscriber terminals, multichannel radios, tactical facsimile equipment, and many other associated items. This



TRI-TAC

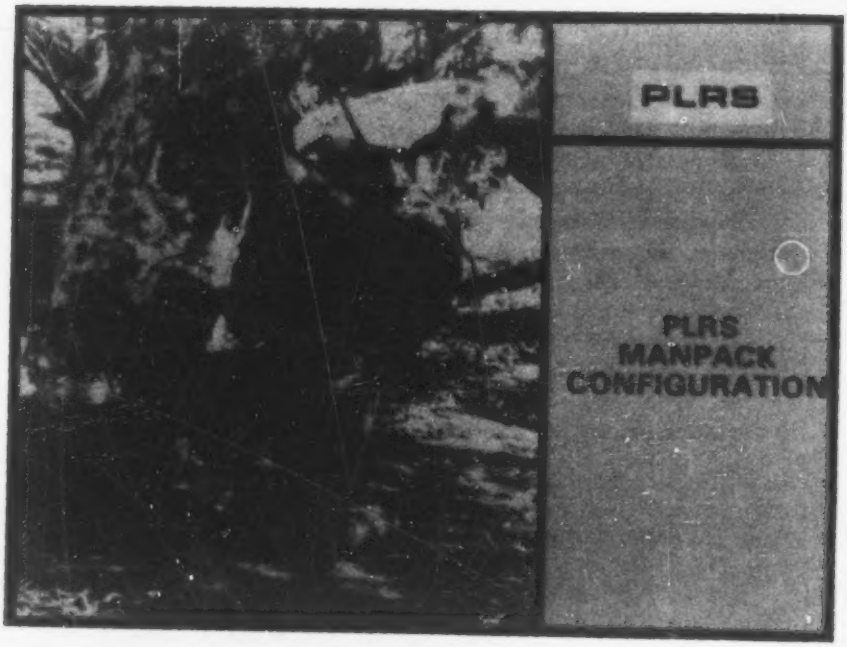
equipment is urgently needed to replace the obsolete, non-secure, manpower intensive, and predominantly manual communications equipment currently in the field. TRI-TAC equipment is designed to provide for an evolutionary transition from analog communications to modern and flexible digital communications. This will satisfy an urgent need since there is no digital switching capability in the Army's current tactical inventory of equipment. Equally important is the fact that TRI-TAC is designed to survive in a combat environment. It incorporates both nuclear hardening and jam resistant techniques.

The Army is responsible for development of the TRI-TAC switches. We are now procuring the circuit and message switches which will be the heart of multichannel networks connecting telephones, message traffic, and data users in both secure and non-secure modes. FY83 funds will complete this buy.

The Army does not presently have a tactical radio system capable of operating in the electronic countermeasure environment expected. The Single Channel Ground and Airborne Radio System, SINCGARS, will give the soldier a jam resistant, securable radio system capable of operating on

the move and compatible with current vehicular radios and associated communications security equipment. The FY83 budget request accelerates the fielding of this urgently needed combat radio.

Any future conflict will require combat commanders to rapidly and precisely locate and identify their own forces and other friendly units on a highly mobile and extended battlefield. The Position Location Reporting System (PLRS), a joint program with the US Marine Corps, will give us that capability. It is cryptosecure, highly resistant to jamming and can be used in all weather and terrain. Later in the 80's, PLRS will be integrated with the Joint Tactical Information Distribution System (JTIDS) Class 2 terminal to form the Army Data Distribution System (ADDS), or PLRS/JTIDS Hybrid (PJH). As an enhancement of both programs, the ADDS will provide the Army with a reliable jam resistant data communications, navigation and identification system for use in the five primary functional areas which require C3 on the battlefield: Maneuver Control, Fire Support, Air Defense, Electronic Warfare/Intelligence, and Combat Service Support. We consider attainment of this capability a high priority for successful combat operations.

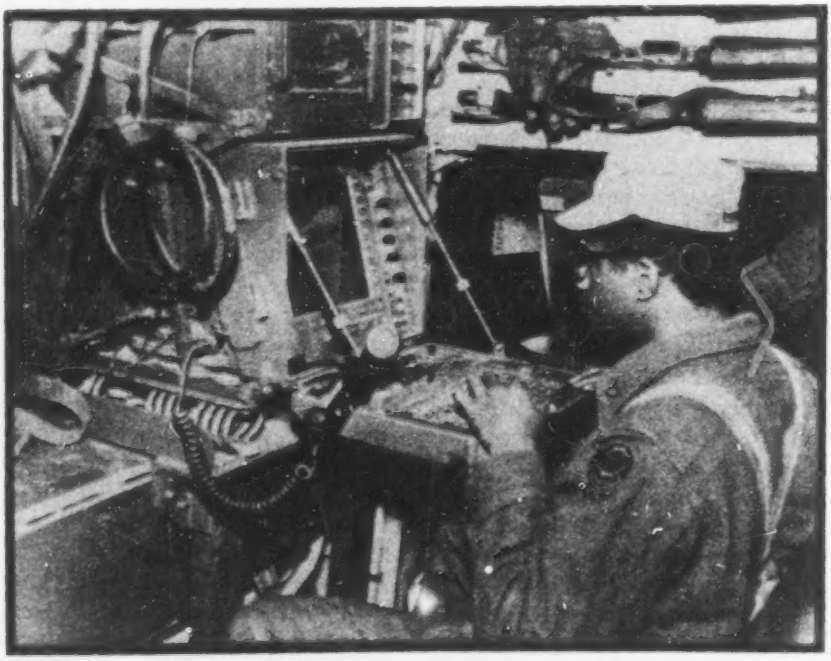


PLRS

PLRS therefore, in addition to its own merits, requires prompt procurement to establish a base for the follow-on system.

Although Congress denied procurement funding for the basic PLRS in FY82, it recognized an urgent need for the system and invited the Defense Department to restate its case with either a reprogramming action or supplemental request. In response, we have initiated an accelerated and reprioritized RDTE effort which will effectively address the development issues raised by Congress. Concurrently, we are moving toward the service production decisions for PLRS this spring which, if favorable, may be followed by a formal resubmission for FY82 production funds.

A Maneuver Control System prototype was introduced into Europe in FY81 to gain experience in the development of an automated battlefield information system. Three Tactical Computer Systems (TCS) (minicomputers) and seventeen Tactical Computer Terminals (TCT) (microprocessor systems) were deployed and evaluated in field exercises. Key uses for the system by operations staffs were processing and distributing estimates, plans, orders, and reports. Evolutionary development of the system will continue in FY83. Pending a successful acquisition review, additional equipment to field a tactical automated command and control system will be procured in FY83.



Maneuver Control System

Tactical Satellite Communication (TACSATCOM) systems support the ground mobile forces of the Army, Air Force, Navy, and Marine Corps by providing reliable and effective communications between widely dispersed and rapidly moving forces. Each of the systems uses a communications satellite as a relay station between two terminals, obviating the need for line of sight between the terminals. Terrain is, therefore, less of a constraint for employment of TACSATCOM systems than for regular terrestrial systems.

Presently, two single-channel and one multichannel system are being fielded. The single-channel system operates in the Super High Frequency Range. Production of the single-channel Special Communications System, AN/MSC-64, will be completed in 1983. It will provide secure command and control communications from the National Command Authority to special weapons units world-wide. In addition, a two year production contract has been awarded for a single-channel UHF manpack for use by Special Forces and Ranger Units. The Multichannel Initial System, AN/TCS-93 and AN/TCS-85, provides tactical satellite communications down to brigade level.

In the future, one single-channel and one multichannel system will be fielded. The Single Channel Objective Tactical Terminal (SCOTT), currently in Advanced Development, is an extremely high frequency (EHF) system which provides a jam resistant satellite communication link. The Multichannel Objective System (MCOS), also a jam resistant EHF system, is still in the concept validation stage.

The Defense Satellite Communications System (DSCS) is a worldwide military satellite communications which supports Presidential communications, National Command Authority, Worldwide Military Command and Control System, JCS, NSA, Diplomatic Telecommunications System, and tactical/strategic C3I requirements of the Military Departments. The DSCS is also compatible with NATO and UK military satellite communications systems as well as foreign and domestic commercial systems. DSCS provides the capability to satisfy RDJTF and RDF-A communications both within theater or strategically on a worldwide basis, and is the only capability in existence to satisfy critical wideband command, control, and intelligence communications.

DSCS is a Joint, OSD program effort. Air Force is responsible for space and the Army is responsible for the ground subsystem. In the past few years Army has undertaken a complete upgrade and modernization effort that will result

in the development, procurement, and worldwide installation of a new generation of large, medium, and transportable satellite terminals, equipped with digital communications and anti-jam equipment, and a new automated system that will control the DSCS satellites in orbit as well as communications that pass through the satellite.

In support of the DSCS, Army is currently engaged in the procurement of 33 new AN/GSC-49 satellite terminals for the Jam Resistant Secure Communications program that will support the Tactical Warning and Tactical Accessment system, WMCCS, and CINCS/NCA during enemy jamming or periods of highly volatile world conditions.

The NAVSTAR Global Positioning System (GPS) is a satellite-based radio navigation system that provides users with instantaneous data about position, velocity, and time. No other navigation or positioning system, present or programmed, does this. When fully deployed, the system will consist of 18 satellites and thousands of user terminals.

GPS will be employed by units that normally operate at long ranges from their home bases, such as cavalry, pathfinders, and Special Forces. It will also serve as an "initializer" for other position/navigation systems.

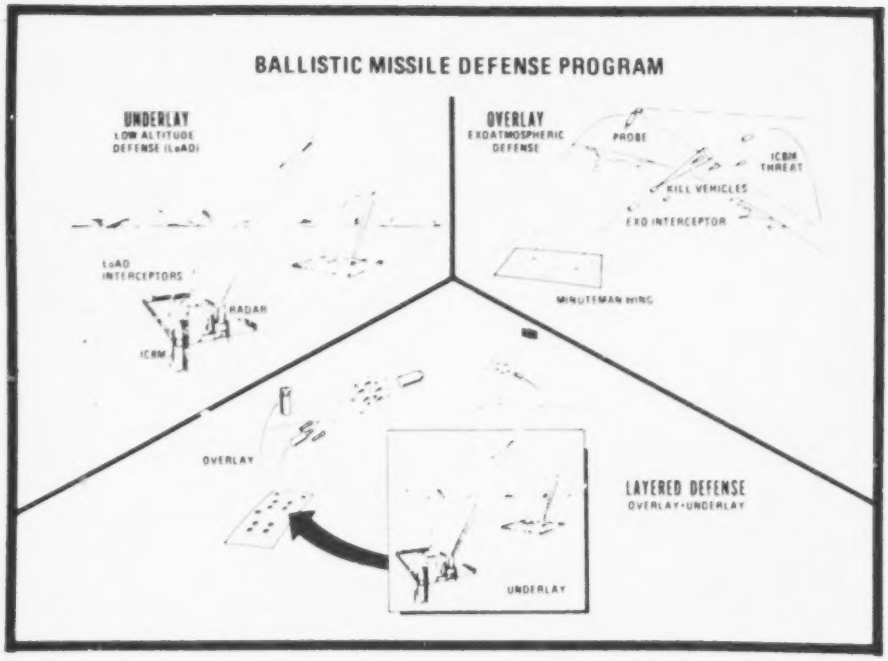
GPS is a joint program with the Air Force as lead and Army, Navy and NATO staffing in the Program Office. The Army is participating in the joint development of a family of manpack, vehicular, and aircraft user terminals. The Congress denied, without prejudice, the Army's funding for NAVSTAR GPS in FY82. We intend to present a reprogramming request to partially restore FY82 funding and have requested FY83 funding to continue this development effort.

BALLISTIC MISSILE DEFENSE

The US Ballistic Missile Defense (BMD) R&D Program, the Army's only strategic weapon development effort, is currently undergoing significant acceleration and change. The selection of BMD as one of the three options to be considered in future ICBM deployment decisions renews emphasis on this vital program. Since the demise of SAFEGUARD, the US has had no deployed BMD system, but a continuing BMD R&D program has given the US the capability to develop and rapidly deploy the most advanced and effective systems permitted by existing technology. Past R&D efforts are maturing, and the potential for effective defense systems has never been greater. While development of BMD options for ICBM defense has the highest priority, other BMD efforts hold promise for the defense of a wide range of strategic targets in the face of unconstrained threat growth. Progress has been equally dramatic in expanding and advancing the technology base from which future BMD systems will evolve.

The new strategic program for the nation recognizes that a ground-based ICBM deployment mode protected by BMD might be a highly cost effective solution to the ICBM vulnerability problem. As a result, the BMD Program will accelerate the development of options to support the 1983 decision date on the possible deployment of a BMD system to defend silo-based ICBMS. The existing Low Altitude Defense (LoAD) program will be restructured from a preprototype demonstration to an accelerated development effort. The resulting system will capitalize on LoAD components and technologies and will be capable of defending not only ICBMs in silos but other selected strategic targets as well.

While deployment of a LoAD system could significantly increase the survivability of the land-based ICBM force, the current Soviet force expansion points up the need to provide future options to counter a continued build-up of the Soviet threat. The exoatmospheric Overlay program provides the logical growth path for system expansion. The Overlay, when combined with a LoAD-like terminal defense system, would provide a robust two-tier Layered Defense of fixed-based ICBMs as the long-term response to an unconstrained growth in the numbers of Soviet reentry vehicles. As another part of the strategic program, the advanced technology work will continue to support technical upgrades for all systems and investigate future system concepts such as space-based BMD.



Although ICBM defense is considered to be the primary potential role for BMD, other important missions also exist and are being addressed by the BMD Program. For instance, roles for the Layered Defense include protection of SAC bases, critical communications nodes, the locations of key decision makers, and other high value strategic targets. By pursuing both endoatmospheric (LoAD-like) and exoatmospheric (Overlay) defense concepts, the BMD Program maintains the flexibility to provide defense option for many different applications. In additions to the defense missions, derivatives of BMD developed technologies could have use in such varied applications as augmenting or reconstituting early warning and attack assessment sensors and in potential anti-tactical missile systems.

To accomplish the above task, the BMD R&D effort is organized into two complementary program elements--the Advanced Technology Program (ATP) and the Systems Technology Program (STP). The ATP is designed to advance BMD-relevant technologies and to explore potentially revolutionary systems concepts. The STP integrates those technologies suitable for transition to systems applications into a systems context and validates the integrated technologies through high fidelity simulation and testing.

The BMD Program Manager also is the National Range Commander for the Kwajalein Missile Range (KMR) and is

responsible for its operation. The simultaneous use of KMR for both strategic offensive and defensive program testing provides a unique opportunity to collect realistic data vital to both efforts. The ability of the BMD Program to observe and analyze developmental and operational firings allows cost savings in the tens of millions of dollars yearly. Kwajalein is the only range in the free world that can accommodate full-scale ICBM tests and provide sophicated data collection for the terminal portion of the trajectory. KMR is a unique national resource, utilized by all of the services, NASA, and other government agencies.

The BMD Program seeks a balance between two major objectives--that of maintaining cost-effective defense options which can be developed and deployed rapidly with low risk, and that of maturing advanced technology and system concepts which can become cost-effective counters to projected Soviet threat growth. BMD system development efforts will continue to be focused on LoAD as an advanced terminal defense system and on the Overlay program. The acceleration of R&D on LoAD will provide, by 1983, a high confidence option for early deployment. The Overlay program will continue the demonstration and validation of key technology issues in order to provide the essential technology base for future system development.

The FY 1983 budget request includes funding for both ATP and STP. The STP funding represents a significant increase over FY 1982 and reflects the LoAD program acceleration to meet the 1983 deployment decision date.

MEDICAL RESEARCH

Together with modern battlefield weapons systems, the soldier must be considered a "system" and as the operator, is the most vulnerable and critical component in the array of battlefield systems. The Army Medical Research and Development Program is geared to address the factors that could make this system inoperable or cause it to operate at reduced efficiency due to physical, psychological or disease-related stresses in a variety of climates and hostile environments both in peacetime and during periods of hostilities.

Many of the normal, daily hazards to the soldier come from sources such as blast overpressure from artillery, combustion fumes from explosions, and radiation from laser, microwave and radar systems. Army Medical Research addresses these environmental and occupational hazards.

Advances are also being made to aid the soldier in dealing with natural stresses. These include heat, cold, altitude, sleep deprivation, exhaustion, and the psychological strain of the battlefield. However, our personnel are more likely to become casualties from infectious diseases that have decimated military forces during past wars than from any man made weapon system. We have made good progress in this area and many diseases can be prevented by vaccines or treated if a soldier is afflicted. In the tropical or remote parts of the world, there are deadly diseases for which we have neither cures nor means of prevention. Even malaria, for which many cures have been developed, keeps changing genetically in the face of anti-malarial drug use in endemic areas. Diarrheal diseases, sand-fly fever, Rift Valley Fever-to mention just a few-pose a threat to troops in areas such as the Middle East, even in the absence of combat. We are continuing to direct our efforts to cope with these problems and have made some progress.

During periods of hostilities, the soldier may be incapacitated or working at reduced efficiency due to the effects of chemical, nuclear and biological weapons. Enemy use of nuclear, chemical, or biological warfare is a matter of conjecture, but it is an eventuality for which we must prepare. Therefore, to keep the soldier going we are developing modern techniques for disease prevention, patient management, decontamination, and resuscitation in an NBC environment.

For example, a new antidote against nerve agents, 2-PAM Chloride, which can be self-administered, has been developed and an industrial manufacturing base identified.

We are also expanding our efforts to develop medical equipment for operation in a Chemical Warfare environment. These efforts include the development of multi-patient resuscitators for mass casualties, chemical hardening of medical supplies, chemical agent detectors/dosimeters, vital signs monitors, and a patient decontamination systems.

In the more traditional areas, techniques are being improved and materiel developed for the prevention, diagnosis and treatment of combat casualties. Treatment of burn wounds has been greatly improved with increased understanding of healing processes and functions of various components of the body tissues (we can help the body heal itself better). We are also seeking approval for the manufacture of a preservative that will increase the life of stored blood for up to 42 days in field situations where freezing is not practical.

These accomplishments are merely a few of the highlights of an extremely complex and broad research effort encompassing all aspects of potential hazards to the soldier, the crucial "system" on the technologically complex modern battlefield.

TRAINING SIMULATORS

The Army's investment in training simulators has been increasing steadily and there are many important reasons for this. They help to conserve fuel, ammunition, space needed for training, wear and tear on weapons, as well as generally reducing training and operating costs. In addition to conserving scarce resources, there are safety and environmental benefits which accrue from the use of training simulators. Also important is the fact that very realistic training simulation can now be achieved because of advances in technology (e.g., in the use of microprocessors, computer-generated imagery, coded laser devices, and video disc recordings).

The scope of training simulators has broadened remarkably--they can now be used effectively for training repair technicians and logistics operations specialists as well as for weapons instruction and tactical indoctrination. Another noteworthy factor is that today's soldiers--who have grown up in an age of television and electronic games--respond enthusiastically to instruction with advanced simulators.

The Army's motivation in acquiring flight simulators is based on the Army's desire to improve training effectiveness, maintain combat readiness, and cope with current and future fuel cost. In addition to saving fuel and flight hours, flight simulators produce other benefits. These include: improved and more flexible training capability, extended airframe life, reduced aircraft accident exposure, reduced airspace and airfield requirements for training, and a large cost avoidance on ammunition. Flight simulators also offer training opportunities that are either not convenient or not possible in the air. For example, it is possible to observe the students performance in a simulator, freeze a training event, tell him when his performance is unacceptable, demonstrate the correct procedure, and have the student repeat the task until competence is developed. This is an extremely important capability for training those tasks that are dangerous or of significant risk. The student can experience malfunctions and learn to recover from emergency conditions that cannot be safely taught in actual flight. Other important advantages of flight simulators are that pilots can train

regardless of weather conditions, crowded airspace, aircraft availability, and at a greatly reduced flying hour cost. With these benefits in mind, the Army plans on continuing to acquire and make optimum use, where applicable, of modern, high fidelity, synthetic flight trainers to improve training effectiveness and decrease the high cost associated with training.

The first high fidelity flight simulator developed by the Army, incorporating an out-the-window visual capability, was the CH-47 C simulator. This cost effective training device completely replicates the aircraft and even enables the student pilot to practice sling load operations. In May of 1982, the first production CH-47 simulator will be available for training at Fort Campbell. Thereafter, additional simulators will be fielded at Fort Hood and in Germany. One simulator will be procured in FY83. These training devices will enhance the Army's CH-47 aviation training program.

Following the engineering development of the CH-47 simulator, the Army developed the AH-1 Cobra simulator, incorporating the advancements of the CH-47 simulator, it's motion and visual system, and more! The AH-1 simulator permits simulated firing of the TOW missile, 2.75 inch rocket, 7.62 machine gun, 40mm grenade launcher, and the 20mm cannon. The simulator consist of two cockpits representing the pilot and co-pilot gunner stations respectively, with each mounted on its own six degree freedom of motion system. Each cockpit is an authentic replica of the actual aircraft cockpit, and each has its own inspector station. The pilot and co-pilot gunner can be trained separately or as a team. The FY83 budget request includes funds for the procurement of three simulators.

In April 1980, the Army fielded the prototype UH-60 simulator, for student training, at Fort Rucker. The prototype consists of two identical cockpits. The visual system of one cockpit uses current generation map board technology while the second cockpit uses the more advanced technology of computer generated imagery. An evaluation of these visual systems is underway with a decision expected in May of this year. The Blackhawk simulator is primarily oriented toward training tactical flying skills. Additionally, the simulator may be used in training confined area approaches and landings, sling loads and formation flying skills. Completion of the development of this simulator is expected in FY83.

This August, engineering development will begin on the AH-64 Apache Combat Mission Simulator. This training device will replicate all systems of the Apache aircraft, to include the helmet mounted display, an out-the-window visual system, co-pilot gunner target acquisition device, and all the aircraft weapon systems to include Hellfire. The prototype simulator will be ready for student training no later than August 1985. The device will be comprised of a pilot and co-pilot gunner module each with a motion system and instructor station. The pilot and co-pilot gunner will likewise have the capability to train individually or train as a team performing a combat mission. The Army is continually advancing the art in flight training devices, seeking training equipment which replicate all aspects of flight, weapon system, and the sound and fury of battle. The flight simulators which the Army has developed, train today's pilots better and at less cost than ever before.

In the armored vehicle area, procurement continues on training simulators for the Abrams' Tank, and the Fighting Vehicle System. The Unit Conduct of Fire Trainers (UCOFT) which are being procured in FY83 will provide battalion level training for tank gunners and commanders on turret/gun controls, target acquisition, and engagement of targets. The long term goal is to produce a large number of uniformly trained comm ıders and gunners. Turret Maintenance Trainers are also being procured to provide institutional training in M1 Tank turret fault isolation and repair skills.

Unit Conduct of Fire Trainers (U-COFT) are being procured in FY83 to provide battalion-level training for IFV-CFV gunners and commanders on turret/gun controls, target acquisition and engagement. R&D funds are being used in FY83 to complete development of the Institutional Conduct of Fire Trainers (I-COFT) and turret maintenance trainers, leading to procurement of both starting in FY84.

In December 1981, COFT prototype evaluations were completed at Fort Benning, GA and Orlando, FL. The results of these tests indicate that soldiers who have never seen or operated an IFV can readily master firing skills using the Conduct of Fire Trainer. When compared to a control group of soldiers who have had previous on-vehicle experience, gunnery proficiency scores were closely aligned and minimal additional gunnery training was required.

The Signal Intelligence/Electronic Warfare Simulator (SIGINT/EW Simulator) is a communication network simulator used as a training and evaluation vehicle. The device will be able to generate a simulated threat electromagnatic environment tailored to the tactical mission of the using unit. It will provide 256 primary and associated background signals that include voice (i.e., Russian, Czech, Polish, German, North Korean and 3rd World) morse, teletype and radar signals. The goal is to provide a capability to conduct intensive technical SIGINT training using tactical mission equipment driven by a digitally controlled system. The system simulates all aspects of the threat communication network in the context of a specific tactical scenario. This effort is an off-the-shelf buy and requires no developmental resources. FY83 funds will be used to fund a contract scheduled for award in November 1982 with first delivery in June 1983.

There is also a far reaching program for non-system peculiar training devices, such as the Multiple Integrated Laser Engagement System (MILES), which allows soldiers to fire weapons systems using laser devices to simulate fire effects in real time during full-maneuver tactical exercises.

Making provisions for training simulators has become an integral part of weapon system planning, and the resulting benefits promise us a more efficient, economical way to achieve high quality training.

PROGRAMWIDE MANAGEMENT AND SUPPORT/RDTE MANAGEMENT

The US effort to maintain a lead in weapons system technology is highly dependent on sustaining an overall stable, high quality R&D management and support capability. Adequate numbers and kinds of professional personnel must be made available along with current state-of-the art equipment and related logistical services. The synchronization of all the Army's R&D efforts and of individual systems as they progress from basic research through development stages, as well as the availability of adequate support, are key to insuring the Army's success in its R&D programs. The dramatic changes in weapon system technology and sophistication carry with them a demand for a complementary adjustment of management resources and support.

Resources for some activities such as the purchase of laboratory equipment and common service support activities at RDTE-operated installations and headquarters are not related to specific R&D projects. These resources are requested in the Programwide Activities program.

The Army must update and modernize its laboratory equipment. Most of our laboratory equipment was purchased immediately following WWII. A phased replacement program is mandatory if the Army is to maintain state-of-the-art capability to support an R&D program to meet our future needs.

The FY 1983 budget request supports the manpower and related cost necessary to manage the Army's overall RDTE mission. We request your support of this less dramatic, but vitally important, portion of the FY 1983 budget request.

CONCLUSION

The FY83 budget request represents our best effort to provide a balanced program to equip the Army. It doesn't attempt to out produce the Soviets, but it does attempt to insure that our units have the equipment they are authorized, and that our soldiers are equipped with weapons and equipment that are as good as the Soviets' and in many cases better than the Soviets'.

Thanks to our research and development efforts during the 1970's we are ready to field the new weapons and equipment. However, in order for us to provide our Army with the capabilities that we have described we need strong Congressional support.

With your help and the support of the people, we will provide our Army with what is needed in order for it to be ready should it be called upon to protect this nation's vital interests.

Mr. SMITH. For Senator Goldwater the subcommittee is adjourned.

Thank you.

[Whereupon, at 12:47 p.m., the subcommittee adjourned, subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

THURSDAY, MARCH 4, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

ARMY TACTICAL WEAPONS PROGRAM

The subcommittee met, in executive session, pursuant to notice, at 8:02 a.m., Senator Barry Goldwater (chairman) presiding.

Present: Senators Goldwater, Warner, and Levin.

Staff present: Robert S. Dotson, George K. Johnson, Jr., José E. Martinez, and Carl M. Smith, professional staff members; and Tamara L. Jones, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Buzz Hefti, assistant to Senator Warner; Jon Etherton, assistant to Senator Jepsen; Frank Krebs, assistant to Senator Cannon; Gray Armistead, assistant to Senator Byrd; and Peter Lennon, assistant to Senator Levin.

Senator GOLDWATER. The subcommittee will come to order.

Gentlemen, we will take up where we left off yesterday. We have a full committee meeting at 11 a.m., so we have 3 hours.

STATEMENT OF DR. JAY R. SCULLEY, ASSISTANT SECRETARY OF THE ARMY FOR RESEARCH, DEVELOPMENT AND ACQUISITION, DEPARTMENT OF THE ARMY, ACCOMPANIED BY LT. GEN. JAMES H. MERRYMAN, USA, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT AND ACQUISITION, U.S. ARMY; MAJ. GEN. L. F. SKIBBIE, USA, DIRECTOR, COMBAT SUPPORT SYSTEMS, DEPARTMENT OF THE ARMY; AND BRIG. GEN. ELLIS PARKER, USA, DEPUTY DIRECTOR, REQUIREMENTS, ARMY AVIATION OFFICER, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS

General MERRYMAN. The first system we will discuss today is the MLRS, or multiple launch rocket system.

Multiple launch rocket system (MLRS)

	Millions
Fiscal year 1983 R.D.T. & E. request	$23.2
Fiscal year 1983 weapons system procurement request	444.4

High volume fires at extended ranges.
Accelerated schedule.
Fiscal year 1983—3rd year of production.
Total buy—333 launchers; 362,832 rockets.
6,210 rockets/112 launchers procured through fiscal year 1982 FDP.

91-866 O—82——18

This system will provide the Army with its first multiple-launch rocket artillery since World War II. It has been a success story, Senator Goldwater, and I am proud to be able to tell you about it here today.

Senator GOLDWATER. When you talk about multiple launch, how many rockets are there?

General MERRYMAN. There are 12. There are two packs of six on the back of that vehicle. If you will look at it, there is a pod of six that that rocket is coming out of, and there is another pod of six to its right.

Senator GOLDWATER. How fast can you fire it?

General MERRYMAN. I watched a film yesterday of a 12-round ripple, and I think one round goes out and the second follows 4 seconds later. So it ripples at 4-second intervals.

Senator GOLDWATER. How fast can you reload?

General MERRYMAN. I forget the number of packs that are there automatically with the SPLL. The SPLL is a self-propelled launcher loader which is a variant of the Bradley body chassis. The power train and suspension are the same. The loading time is [deleted] sir.

Senator GOLDWATER. That is [deleted] to reload?

General MERRYMAN. Yes.

Senator GOLDWATER. What size rocket is that?

General MERRYMAN. Nine inch, sir.

Senator GOLDWATER. And what range can you get?

General MERRYMAN. Better than 30 kilometers. We are getting currently about [deleted].

Senator GOLDWATER. What is the propellant?

General MERRYMAN. It is solid propellant, sir.

Senator GOLDWATER. That is maximum range and you can aim it at any range you want; is that right?

General MERRYMAN. Yes, sir; [deleted] is about the maximum range and [deleted] is the minimum range. You have regular cannon artillery that can fill the gap from right in front of you on out actually to about 30 kilometers too. I might comment, for example, on that film I saw yesterday, where we fired all 12 rounds. We fired at a target 17 kilometers down range. This target was in an area 300 meters wide and 240 meters in depth. In that area, we had 29 vehicles—everything from helicopters to APC's, trucks and tanks, 101 dummy personnel, POL stacks, and ammunition stacks.

After we fired the 12 rockets at that range we went out and looked at all of those targets. There was shrapnel in every single target, which, as you can imagine, was very pleasing to us, because it shows the submunition dispersion, and that is what we are looking for. This is a four-country development—France, Great Britain, Germany, and ourselves are jointly developing this weapon system.

There are four warheads under development. The first one is the dual-purpose, and improved submunition warhead that we fired in our recent test. It is called dual purpose because the submunition can penetrate about 2½ inches of armor as well as kill personnel. Each warhead contains 664 of the submunitions. The second round is an antitank mine that Germany is developing. The third one is a

terminally guided warhead currently in concept definition; and the fourth one is the chemical warhead which the United States is developing.

The development has been accelerated and we are currently on a 67-month development schedule.

My next few slides will show you why I refer to this, sir, as a real success story.

[Chart deleted.]

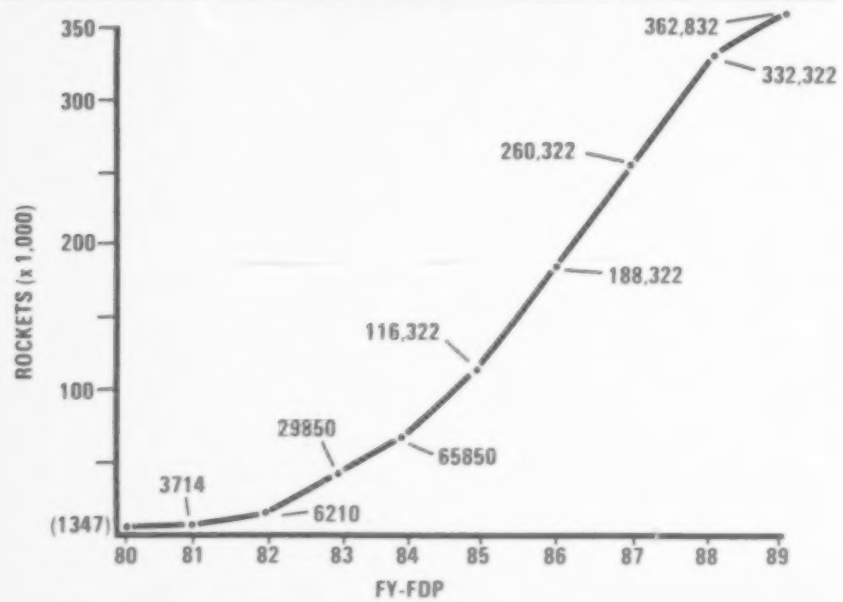
What I show you here, sir, is what the Soviets have that has a similar capability. The 122-millimeter has a range of about [deleted] kilometers and it carries [deleted] rockets. [Deleted.] The Soviets, as you know, have had rocket artillery ever since World War II.

MLRS FISCAL YEAR 1983 BUDGET REQUEST

Provides for: Procurement of 23,640 rockets; 72 launchers.
Completion of maturation R. & D.

This shows you what the 1983 dollars will buy. Let me tell you how we plan to proceed. Our plan is to go to the prime contractor, Vought, and try to get a multiyear contract, like we were discussing yesterday. We have sufficient dollars in the budget to do that. Failing to get a good contract with the prime contractor we intend to look into a second source, so it looks very promising from this standpoint.

MLRS ROCKET PROCUREMENT OBJECTIVE



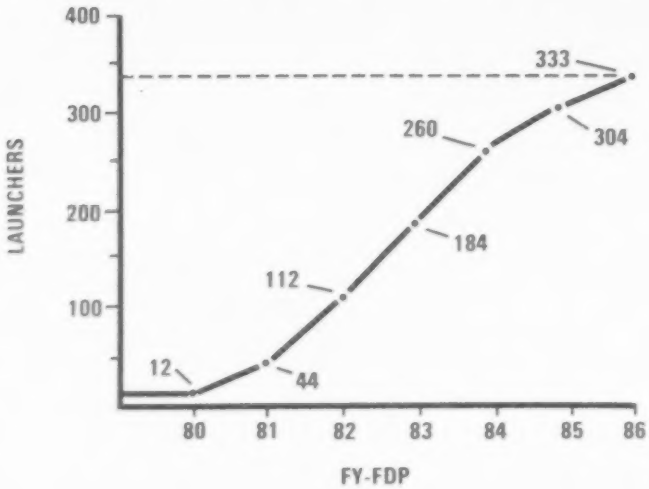
This slide shows you how we plan to buy the system through 1989, to our procurement objective, and the number we would buy

each year assuming that the Congress supports our procurement, and requests. Those are rockets that you are looking at there, sir.

Senator GOLDWATER. Those are missiles?

General MERRYMAN. Rockets, sir.

MLRS LAUNCHER PROCUREMENT OBJECTIVE



The next slide shows you these, and these are the launchers.

Senator GOLDWATER. Have you figured out what one missile costs?

General MERRYMAN. Yes, sir; it is $6,107 in constant fiscal year 1983 dollars.

Senator GOLDWATER. That is one missile?

General MERRYMAN. Yes, sir.

MLRS - FINANCIAL SUMMARY

*PROGRAM UNIT COST
(CONSTANT FY 83 $)

DEV EST FY 78	18.97
FY 82	12.02
FY 83	9.93

COST GROWTH

FY 82-83	-17%
TOTAL	-47%

		FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E		263.3	38.2	23.2	—	—	324.7
$ WPN SYS PROC		180.1	205.6	444.4	584.8	2397.3	3812.2
QTY	LAUNCHER	44	68	72	76	73	333
	ROCKET	3714	2496	23,640	36,000	296,982	362,832

* 1 UNIT IS A LAUNCHER AND 1140 ROCKETS

$(000,000)

This slide, sir, shows you the financial status, and you will notice in the upper left corner I show you what the program unit cost development estimate was in fiscal year 1983 dollars. The second line shows you what it was in 1982 and the third line shows you the current estimate in 1983 dollars.

I am sorry to say this is the only system that we have today that shows you a significant cost reduction. If you go over to the right, you will notice that the cost of this system has gone the right way; from 1982 to 1983 it went down 17 percent and over all it went down 47 percent.

Now, the reason this happened, Senator Goldwater, is not because it differs that much from some of the other programs but we nearly doubled the number of launchers. We increased the number of launchers significantly from the original program to the current program, and when you do this, of course, unit procurement costs go down. That is why the significant drop here. However, even if we had not done so there would still have been a reduction because of the success of this particular program.

We originally had planned to buy 173 launchers. That has been increased by an additional 160 launchers for the force. You will notice a fiscal year breakout in the bottom block. The far right column shows you that in R. & D. we plan to spend $324 million; and the second line is the procurement expenditure. Then the next line shows the launchers we will buy, and the final line shows you the rockets we will buy.

The 1983 column, which is the fourth one from the right, breaks out what we will do with the 1983 dollars.

Senator GOLDWATER. What is the unit cost of the launcher?

General MERRYMAN. The average rocket procurement cost is $5,841 in fiscal year 1983 constant dollars.

Senator GOLDWATER. That is the rocket?

General MERRYMAN. Yes, sir; that is for fiscal year 1983.

Senator, I don't have an exact number for the launcher but I can get it for you. It is around $2 million.

Senator GOLDWATER. As a guess, what would you say?

General MERRYMAN. About $2 million. The reason this young man is answering questions, is that until I gave him this job he was the MLRS system coordinator

[The information follows:]

General MERRYMAN. The current estimate for the MLRS launcher unit cost is $2,312,303 in escalated dollars. This cost represents a reduction of $52,195 in constant fiscal year 1978 dollars, from the original planning estimate.

Senator GOLDWATER. All right. Where have you been testing this, at White Sands?

General MERRYMAN. White Sands, N. Mex. The latest firing was at White Sands. I might mention, sir, that the program manager for this system was just selected as the program manager of the year in the Army.

We will now go to the next system.

Fire support team vehicle (FISTV)

	Millions
Fiscal year 1983 R.D.T & E. request	$6.9
Fiscal year 1983 weapons system procurement request	71.9

Improved capability for locating/designating targets, mobility and armor protection.

Fiscal year 1983—1st year of production.

Total buy—967.

On this slide I have shown you a picture of what we refer to as a FISTV, that is, a fire support team vehicle. What this does is put a GLLD, that is, a ground locator laser designator, under armor; it also provides a way to put the fire support team under armor.

The fire support team is a group of soldiers who go out and find targets and relay enemy positions back to the field artillery.

With the Copperhead and other laser directed munitions we need laser designators up in the front lines. With the increase in Soviet artillery we need some way to better protect the fire support team and the laser designator, and that is what this vehicle gives us.

Senator GOLDWATER. Do you have a better picture of it? I am looking for it in the book here.

General MERRYMAN. There should be a picture in that book, sir. That is the only picture that we have here.

Senator GOLDWATER. I don't find it in the book.

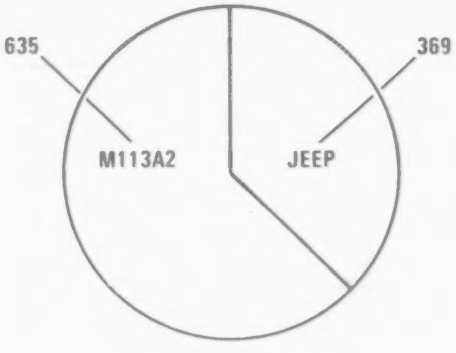
General MERRYMAN. What you are looking at here is just an M-113 chassis. Here is your laser designator, which can go down into the vehicle. It also provides an opportunity where you can go up behind a mound of dirt or other cover and the only thing that the enemy would see would just be the laser designator. Everything else would be under cover.

I have a picture of it here, but it is about the same thing you have. I have a similar picture, Senator, on page 32.

Senator GOLDWATER. I would like to get some idea of how big it is. It looks small but it is not small?

General MERRYMAN. No, sir. This is the same M-113 that you have seen. We have hundreds of them. The gadget that is on top is sizable because it is the regular ground-launched designator with armor protection around it so that it can be protected against artillery.

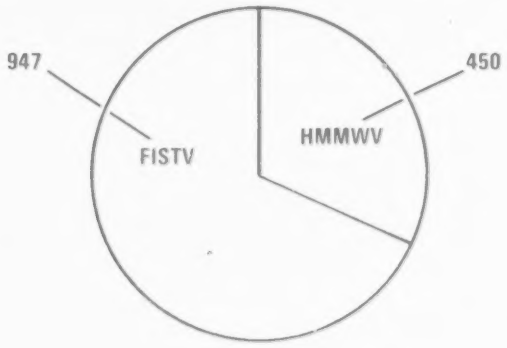
FIRE SUPPORT TEAM ASSETS
END FY 82 FDP



TOTAL ASSETS: 1004

Now, this shows you, Senator Goldwater, how our fire support teams currently go to battle. They go out in a regular jeep or regular armored personnel carrier (APC). What this means is that, in order to locate the enemy they must get out of the APC and expose themselves to enemy artillery fire; that is why we need this vehicle. In addition to providing that protection, it provides the right communications in the same vehicle so you can do it all there together, and you don't have to get separated from the vehicle like you do under the current situation.

FIRE SUPPORT TEAM ASSETS
END FY 87 FDP



TOTAL ASSETS: 1397

This shows you, sir, where we hope to be at the end of the fiscal year 1987 funded delivery period. You notice we will have replaced the APC with FISTV. In the upper right-hand corner you will see the HMMWV, that is, the high mobility multipurpose wheeled vehicle, which I will discuss a little later. That vehicle will replace the jeeps that we use currently assigned to fire support teams.

FISTV FISCAL YEAR 1983 BUDGET REQUEST

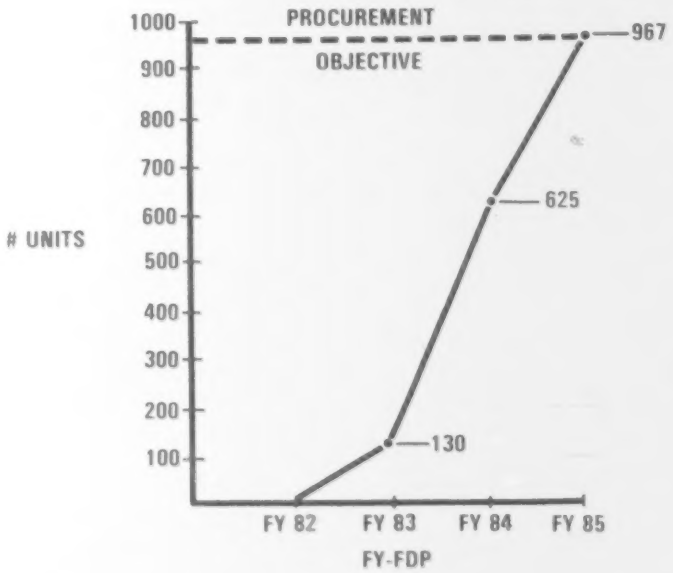
Provides for: Completion of Testing.
Procurement of: Technical data and training packages, 130 FISTV's and initial spares.

This shows you what our 1983 budget provides funds for. We will complete our testing and start our procurement for the items listed.

Senator GOLDWATER. Have you had any cost increase on this system?

General MERRYMAN. The procurement estimate is up 2 percent sir, and the reason it went up is because last March when we went through all of the drills we cut $28 million out of the program. That slipped it to the right a little, and it is up 2 percent.

FISTV PROCUREMENT OBJECTIVE



This shows you how we plan to buy them, procurement objective by 1985.

FISTV - FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	17.1	9.6	6.9	—	—	33.6
WPN SYS PROC	—	—	71.9	208.2	151.5	431.6
QUANTITY BUY	—	—	130	495	342	967

This shows you the financial summary.

Senator GOLDWATER. Let me ask you, what do the Soviets have that is comparable to this, sir?

General MERRYMAN. Nothing, sir. This is one of the things that will give us a chance out there. They don't have laser-guided munitions, to our knowledge. they don't have something like this, so therefore they need something like this, but what this would provide—and I am going to talk Copperhead a little later—but what this provides, you see, is a capability on the ground, where their vehicle can go in to develop and designate a target so that any 155mm artillery round, any 155mm howitzer in the Army could put a Copperhead projectile on a target or a laser-guided weapon from an AAH could put a weapon system on a point target. It

could also provide a laser designation for any Air Force, laser-guided weapon.

It provides us sort of a quantum jump, in that it can go right with the tanks in the front line, right with the mechanized infantry and withstand Soviet artillery coming in on it, unless it took a direct hit.

Our plan is to go sole source to Emerson Electric for the Hammerhead, with a first year fixed price incentive, and a second and third multiyear contract at a firm, fixed price.

We are buying the GLLD, the laser designator, from Hughes, and a North-seeking gyro from Bendix.

Field artillery ammunition support vehicle (FAASV)

	Millions
Fiscal year 1983 weapons system procurement request	$111.0

Provides field artillery units in Europe an ammunition carrier with significant improvements in payload, handling, and crew survivability.
Same body chassis as howitzer.
Fiscal year 1983—1st year of procurement.
Total buy—1488.

This is another vehicle that we are buying, Senator Goldwater, to enchance the capability of our field artillery. It does much the same thing as the last one did. The last one put the laser designator and fire support team, those young men who are forward observers, under metal. What this does is put the ammunition resupply function under metal, so that this vehicle can go up to an artillery piece in a mechanized or armored division which is already under cover, and reload.

That vehicle is full of ammunition under cover, you see, so that you could actually have fire coming in and be able to transload ammunition into the 155mm or the 8-inch howitzers.

Senator GOLDWATER. That looks like a pretty big vehicle.

General MERRYMAN. That it is. You have seen a selfpropelled 155mm or M109 Howitzer and that is what that is. In other words, from this point all of this bottom part is just an M109. If that were a cannon tube instead of this cover, you would just have another M-109 Howitzer.

Senator GOLDWATER. How many rounds will that carry, let us say, of 5-inch shell?

General MERRYMAN. It will carry 155mm and 8-inch. It will carry 90 155mm rounds and 48 8-inch rounds.

Now, currently what we have is an ammunition vehicle called the M548 which you may be familiar with. All it has, it is just a tracked vehicle with a piece of canvas over it, and there in lies the problem. The canvas will not protect you from very much.

Senator GOLDWATER. If I wanted to see this piece of equipment where would I go?

General MERRYMAN. BMY, of York Pa., is the company that has produced the ones produced thus far, sir. I don't know if there is one up there or not.

Dr. SCULLEY. I have been there within the last 4 weeks, Mr. Chairman, and seen the prototype.

Senator GOLDWATER. Where is it?

Dr. SCULLEY. Bowen-McLaughlin-York at York, Pa.

Senator GOLDWATER. Have you any out in the field in the West, any desert bases?

Dr. SCULLEY. At Fort Sill, yes sir.

Senator GOLDWATER. You have one at Fort Sill?

Dr. SCULLEY. Yes.

Senator GOLDWATER. How about Fort Hood?

General MERRYMAN. I will have to check. We have tested two at Yuma, and we have tested three at Sill, recently. Whether the two are still at Yuma, I don't know. I can check to find out.

Senator GOLDWATER. Would you do that?

General MERRYMAN. Yes.

Senator GOLDWATER. As a favor to me, would you just write me a personal letter telling where I can see each of these pieces and I would like to take a trip and get better acquainted with them.

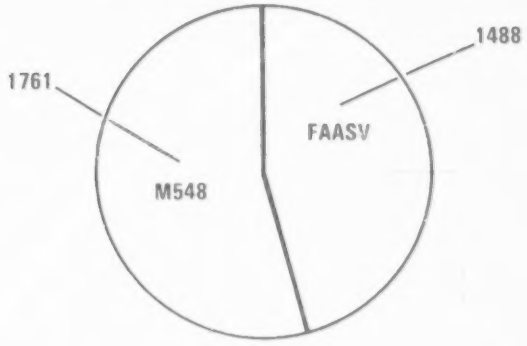
General MERRYMAN. I would be happy to.

AMMUNITION CARRIER ASSETS
END FY 82 FDP

TOTAL ASSETS: 3249

What this shows is just that everything that we currently have, is the M548, which is a canvas-covered supply vehicle.

AMMUNITION CARRIER ASSETS END FY 87 FDP



TOTAL ASSETS: 3249

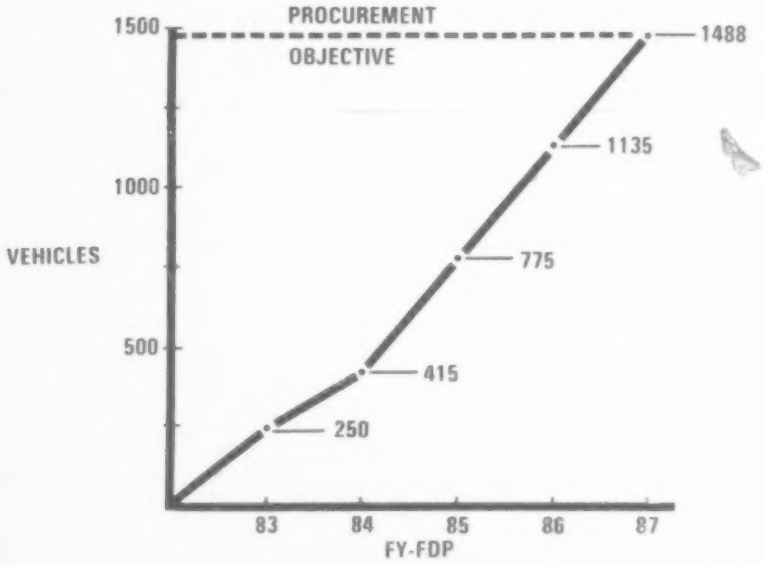
This shows you what we hope to have at the end of the 1987 devlivery period.

FAASV FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement of 250 FAASV.
Spare parts.

This shows you what the 1983 dollars would buy.

FAASV PROCUREMENT OBJECTIVE



This shows you how we would buy out the procurement objective of 1,488.

Senator GOLDWATER. Now, I assume the Soviets must have something like this, don't they? How do they replenish their artillery?

General MERRYMAN. It is on regular wheeled resupply vehicles, or trucks, I don't know for sure if they have any covered vehicles or not.

General PARKER. I don't think so.

General MERRYMAN. I will find out and let you know.

FIELD ARTILLERY AMMUNITION SUPPORT VEHICLE

General MERRYMAN. The Army has no intelligence information indicating that the Soviets have an armored vehicle dedicated to ammunition support similar to the Field Artillery Ammunition Support Vehicle. They do have a lightly armored, multipurpose, tracked vehicle, the MTLB, that could be used for this purpose.

FAASV - FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
WPN SYS PROC	———	—	111.0	77.2	519.7	707.9
QUANTITY BUY	———	—	250	165	1073	1488

$(000,000)

This is a financial summary. There is a separate consideration on this program, in that our M109 base will go dry in 1984 and it depends on the company, BMV, that Dr. Sculley mentioned.

Senator GOLDWATER. What unit costs are you talking about here, roughly?

General MERRYMAN. The average production cost is $329,375 in fiscal year 1983 dollars.

Senator GOLDWATER. What has been your experience with cost increases?

General MERRYMAN. In this program I know of no cost increases at this time.

Remotely piloted vehicle (RPV)

	Million
Fiscal year 1983 R.D.T. & E. request	$77.9

Will extended eyes of combat elements to full range of artillery during day, night, and adverse weather.
Program being accelerated.
Fiscal year 1983—full scale engineering development.
Total buy—995 air vehicles, 74 ground systems.

The next subject I would like to talk to you about is the RPV, that is, the remotely piloted vehicle.

Senator GOLDWATER. Is this a Ryan?

General MERRYMAN. I am not sure. Let me see, sir, It is Lockheed, Senator Goldwater. What this does is provide us an opportunity to send this vehicle over the enemy territory with a television device and target to laser designate that target if we so desire. A follow-on version would allow us to do that either day or night. It is in full-scale development. The first flight will be this summer, and production is scheduled for 1985, and we hope to IOC in 1987.

This past year we had to take money out of this program; that stretched it. The Congress was kind enough to put money back into it in 1982, and we have funded 1983 with an appropriate amount so that it interfaces with what you gave us in 1982. We are currently on a 70-month development program.

Senator GOLDWATER. What is the range of that?

General MERRYMAN. [Deleted] is the range and it has a 3-hour endurance, 160 kilometer per hour air speed.

Senator GOLDWATER. It doesn't even approach sonic speed?

General MERRYMAN. No; it is very slow, sir. [Deleted] of fact, [deleted].

That is very favorable because, as you know, there will be areas on the battlefield in the future where we will not want to send manned aircraft. This remotely piloted vehicle is a tremendous alternative.

I don't know whether you saw the film which shows it going out and finding a tank. It locks the crosshairs on and illuminates it with a laser. Then we shoot a Copperhead missile from an artillery piece which homes in on the tank. This capability is possible because of this little RPV that found and designated the tank. The second version of the RPV will provide a capability to see at night.

Senator GOLDWATER. Have you completed all of the avionics, or is that still going on?

General MERRYMAN. No, sir, we have not. The first flight is this summer. It is in the R. & D. program which will continue for some time. The results have been promising from what we have seen thus far.

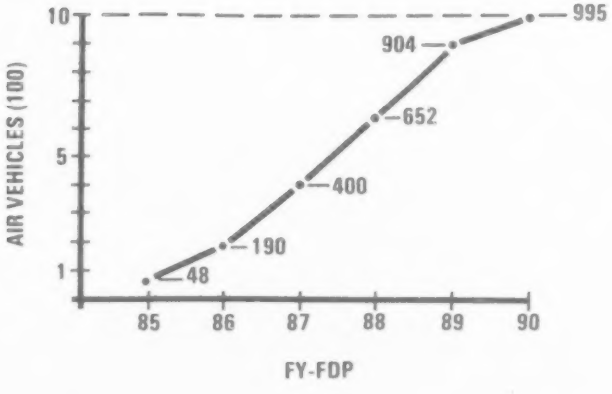
RPV FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Continuation of flight testing.
Delivery of one system to the 9th Inf Div for testing.
Initiation of night vision development.

This shows you what 1983 dollars will buy. That second point, if you will recall, refers to what General Menetrey mentioned about the test bed out at Fort Lewis, where they are testing a lot of equipment. We will get a system out there on the west coast next year, and if you are in that vicinity, you will be able to see it at that time.

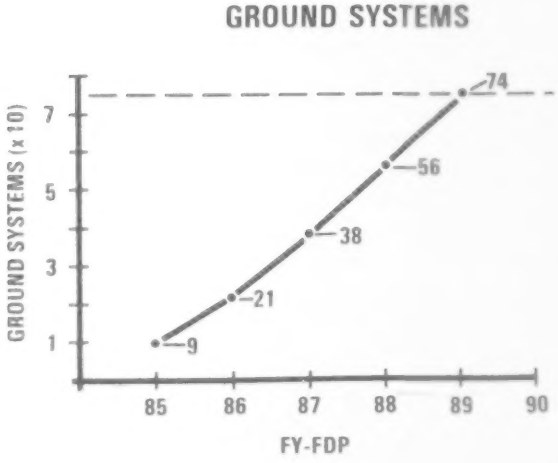
RPV - PROCUREMENT OBJECTIVE

AIR VEHICLES



This chart shows you how we are going to buy out our procurement objective. What you would do with this system is put five air vehicles and one ground section in each of our divisions.

RPV - PROCUREMENT OBJECTIVE



Senator GOLDWATER. What are you talking about in unit cost?

General MERRYMAN. It is $362,000 for the air vehicle, and approximately $4.5 million for the ground section.

Senator GOLDWATER. Where are you testing that? Is that at Edwards?

General MERRYMAN. It will be at Fort Huachuca, sir. There is a lot going on out there.

Senator GOLDWATER. There had better be. I flew an Army general in 1942 to locate that place and we are very proud of it, and they do a good job out there.

General MERRYMAN. It offers opportunities, as you know.

Senator GOLDWATER. It is not hot enough.

General MERRYMAN. I have been there, sir. I flew that TADS/PNVS on the Apache one day and it was quite hot.

Senator GOLDWATER. It gets up to 120° out there.

RPV—FINANCIAL SUMMARY

R.D.T & E. FUNDING

[In millions of dollars]

Fiscal year 1981 and prior	Fiscal year			To complete	Total
	1982	1983	1984		
126.7	73.1	77.9	110.1	86.6	474.4

General MERRYMAN. This is the financial summary, sir, and it shows you what we have in the program. Procurement will start in 1985.

Copperhead

	Millions
Fiscal year 1983 R.D.T. & E. request	$2.1
Fiscal year 1983 weapons system procurement request	183.6

New capability-155mm, artillery to engage moving targets with a high probability of kill.

Only guided missile fired from cannon, 7700 G's.

Fiscal year 1983 4th year of production.

Total buy—44,666 projectiles.

8,520 procured through fiscal year 1982 FDP.

This is the Copperhead, a system I am sure you are familiar with. This would be the fourth year procurement that we are asking funds for, and it is fired from all of our 155mm howitzers. It is a laser-guided projectile; the laser designation could be accomplished either by a Scout helicopter, an Apache, an RPV, or a GLLD on the ground, or in the fire support team vehicle that I showed you a few minutes ago.

Senator GOLDWATER. What is the caliber?

General MERRYMAN. 155 millimeter, sir.

Senator GOLDWATER. And how do you guide the missile after it leaves the cannon?

General MERRYMAN. Let us assume that this hand has a laser designator on it, and that the artillery piece is here. Let us say that the designator is in a Scout helicopter which illuminates the target. The helicopter pilot then tells the artillery to shoot the missile. After it is fired, the missile flies into sort of an egg-shaped basket in the sky. Once in the basket, it receives guidance commands from the laser which is illuminating the target.

Senator GOLDWATER. Who illuminates the target for the laser?

General MERRYMAN. The man with the laser designator, and he can be in a Scout helicopter, or an Attack helicopter, or on the ground, or in that vehicle that I showed you that has the laser.

Senator GOLDWATER. Are you testing this now, or have you tested it?

General MERRYMAN. It is in production, sir.

Senator GOLDWATER. It is?

General MERRYMAN. Yes; it is rather a phenomenal development. As you can see in the second line there when this round leaves the tube it takes 7,700 G's.

Senator GOLDWATER. I wonder if that would really be a "G" or a designator?

General MERRYMAN. The TOW is about 300 or 400 G's. That 7,700 G's has given us some problems, as I am going to show you in a moment, because the cost growth has been phenominal in this system. There are 1,200 parts in a Copperhead round, and I am going to show you in a moment that we have had just about consistent cost overruns. It has been about the worst offender and it has resulted primarily—here, again, as a result of estimating—because nobody knew when they started back there what it was going to take to put this capability together.

Senator GOLDWATER. Where can one see that?

General MERRYMAN. At Fort Sill, of course, and I don't know if there is any other location. I think it is also located at White Sands.

Dr. SCULLEY. It is produced by Martin-Marietta in Orlando, Fla.

Senator GOLDWATER. They are doing all right, I guess?

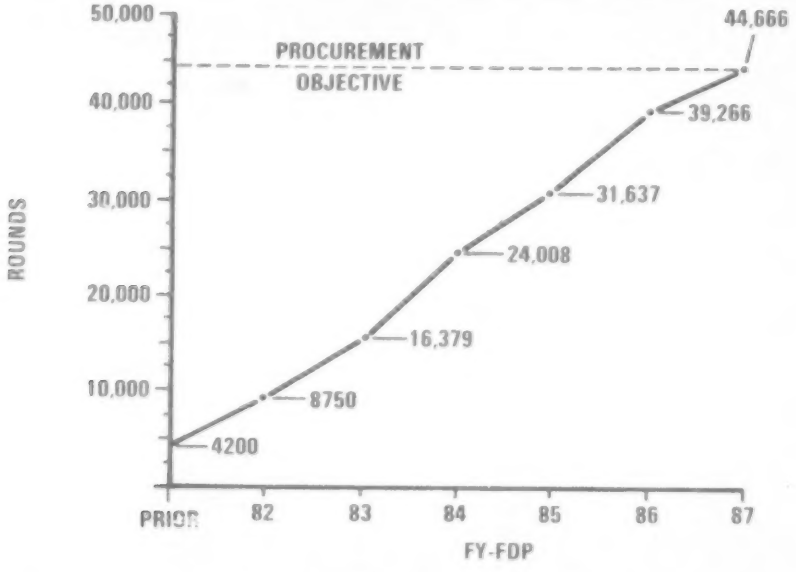
Dr. SCULLEY. It is a very difficult production problem with this round because of the technology.

COPPERHEAD FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement of 7,629 copperhead projectiles.
Completion of warhead improvement program.
Integration of improved warhead into production.

General MERRYMAN. This shows you what the 1983 dollars will buy, sir. What we are talking about here in the second line is that we are improving the warhead to make sure that it will go through anything the Russians might show up with for the next 20 years.

COPPERHEAD PROCUREMENT OBJECTIVE



This shows you the procurement objective and how we plan to buy it out.

COPPERHEAD - FINANCIAL SUMMARY

PROGRAM UNIT COST
(CONSTANT FY 83 $)

DEV EST FY 75	11,090
FY 82	32,364
FY 83	29,640

($ x 1)

COST GROWTH

FY 82-83	-8.4%
TOTAL	+167.3%

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E	149.6	3.3	2.1	—	—	155.0
$ WPN SYS PROC	239.2	141.1	183.6	170.0	475.1	1209.0
QUANTITY BUY	4200	4550	7629	7629	20,658	44,666

$(000,000)

This slide gives you the financial summary.

Senator GOLDWATER. How many firing units are you aiming at?

General MERRYMAN. How many do we plan to buy, you mean?

Senator GOLDWATER. The cannon and the carrier, how many of those do you want to buy?

General MERRYMAN. We already have them, sir. That is part of the beauty of this program, in that if you take the U.S. Army's artillery, better than 75 percent of it will be able to fire this round. This is just a special-purpose round that we will buy and get to the artillery. What that means is that three-fourths of each division's artillery can fire this round. Therefore, Soviet armor coming across at us can be hit up to a range of 16 kilometers by just about all of the field artillery we have.

That is one of the reasons we have continued to pursue this program even though the cost has gone up on it. This chart shows that cost growth. You will see that in the upper box we initially thought we could do it for $11,000 and by 1983, the program unit cost has grown to $29,600.

If you go over to the right, you will see that in the past year we have actually had a reduction in cost growth.

Senator GOLDWATER. That is your cost per round?

General MERRYMAN. Yes sir.

Senator GOLDWATER. What is the muzzle velocity of the Copperhead?

General MERRYMAN. That I don't know, sir, but it is the same as any 155 howitzer.

Dr. SCULLEY. It is in the vicinity of 1,000 to 3,000 feet per second, sir.

General MERRYMAN. One of the reasons for this cost growth, Senator Goldwater, is the fact that we originally planned to buy 133,000 rounds. Now we have reduced that number of rounds to 44,000. If we had kept the number of rounds consistent with the original estimate the cost growth would be about 71 percent, versus 167 percent since the program started. That change in itself moved the cost of the missile up by $6,000. The reason we changed the number of rounds, sir, was that the original guidance from the Department of Defense was to buy to [deleted] days of supply. The current guidance is to buy to [deleted] days. In addition, we have found that the missile is more productive against enemy targets than we originally thought and therefore we could reduce further the number of rounds we need.

At this time I would like to introduce General Parker, who is the Deputy Director of Requirements. He will provide the lead-in to the final combat support and command and communications and electronics section.

STATEMENT OF BRIG. GEN. ELLIS PARKER, USA, DEPUTY DIRECTOR OF REQUIREMENTS, ARMY AVIATION OFFICER, DEPARTMENT OF THE ARMY

General PARKER. Good morning. I am substituting for General Menetrey, who is appearing before another committee this morning. It is a pleasure to assist in helping explain our programs to you.

The first area that I will talk about will be combat service support. Now, these are the functions that sustain the forces that we have organized, equipped, trained, fielded and are modernizing and continuing to train on.

The tendency in this area is to not pay the attention to combat service support that perhaps we do to some of our more glamorous systems. I will submit that history is spotted with failures on the part of senior tacticians who failed to pay attention to this area.

There are significant changes that have occurred in the way we fight that have caused us to be more dependent upon combat service support. Therefore, I will focus my remarks on those areas that will help lead into the major programs that General Merryman described to you.

First, the pace of battle is much faster and tends to be more around the clock. In the past we have had certain elements in a combat zone that fought around the clock, but for the most part, a large portion of the combat force was less capable and therefore did not operate at night.

As we have improved the war-fighting capability of our hardware to meet the threat, the Soviets having done the same. The pace is much faster and that has driven up consumption of fuel, ammunition, repair parts and general supplies.

Combat service support accomplishes many subfunctions and I want to talk just briefly about two of those this morning.

LOGISTIC SUPPORT

Cargo helicopters:
Logistical support/resupply.
Artillery/special weapons movement.
Troop movement.
Equipment recovery.

The first one I will talk to will be logistic support. The high rates of consumption, the improved nightfighting capability and the need for increased dispersion, as we face a tactical nuclear capability, all cause us to become more dependent upon high mobility. That requirement has driven us to be more dependent upon the medium and cargo-type helicopters.

In addition, the munitions of our aggressor have become more lethal and accurate, and the ability to interdict key chokepoints has caused us to become more dependent upon helicopters for meeting the need.

BATTLEFIELD MOBILITY

Utility helicopters:
Tactical troop/cargo transport.
Air cavalry operations.
Med evac.
Mine dispensing.
Unit resupply.
Command/control.

Here are examples of the type of missions that would be flown by our helicopters. Obviously, we need a mix.

Senator GOLDWATER. What is your heaviest helicopter?

General PARKER. The heaviest lift is the CH-47, sir, and as you know, we will discuss that later on this morning. We are going through an improvement program on the helicopter to carry out to the year 2000 and beyond.

The most up-to-date version prior to that modification program would lift 18,000 pounds. Under ideal atmospheric conditions, the CH-47D will be able to lift as much as 24,000 pounds. We also have the Blackhawk which is being fielded and, of course, the UH-1 which will be with us for some time to come. These are examples of the type of aircraft now available for tactical troop and cargo transport. Even though the battlefield has driven us to a lower altitude, we are still able to insert and shift combat power to the right place at the critical time.

The air carried operations are ideally suited to an economy-of-force-type operation. We are out far in advance of our defensive position. We can, therefore, engage the enemy and start to attrite his forces, report reconnaissance and intelligence, and target acquisition, and actually engage and destroy as we withdraw in an economy-of-force-type operation.

As a matter of fact, as you are well aware, in Vietnam we were able to save many lives through the use of aerial medical evacuation.

COMMAND, CONTROL, COMMUNICATIONS

Next I would like to get into Command, Control, and Communications. I think the first point says it all. Without the proper control and communications, the synergistic effect we get from the combined arms team cannot be brought to bear on the enemy. Now, you see what we refer to as the four pillars upon which suc-

cessful war fighting is based. That is Command, Control, Intelligence and Communications.

Under Command and Control, we are referring to several functional areas: Maneuver; fire support; combat service support, which I just talked about in some detail; air defense artillery intelligence; and electronic warfare. All comprise the functional area of Command and Control.

Intelligence and electronic-warfare, enables us to get a fair assessment of the situation and to develop the targeting and the scheme of maneuver we will follow, and to plan our operational security.

Communications enables us to tie all of that together. It enables us to plan, direct, and monitor, analyze and redirect the battle as required. Communications, in short, is the glue that ties all of the functional areas together and permits command and control to occur.

C^{3}I CHARACTERISTICS TODAY

Manual methods.
Old communications technology.
Limited survivability.
Lack of a variety of complementary sensors/jammers.
Limited data transmission.
Range-relay dependent.
Limited anti-jam.
Limited sigint/DF.
Limited interoperabililty.

Sir, this chart reflects the characteristics of our command, control, communications and intelligence C^{3}I, capability. I will give you a minute to peruse that.

Senator GOLDWATER. What type of radio communications are you using? Is it side band or AM or both?

General PARKER. Sir, we use both. We currently have frequency modulated in the very high and ultra-high frequency ranges, and we have AM single side band. Later this morning we are going to talk to you about SINCGARS, a system that will pull together many of our current communications needs into modern, easy-to-train system.

C^{3}I SHORTFALLS

Commo modernization/anti-jam/range.
Surveillance/target acquisition.
Counter C^3.
Automation of intell/EW and operations.
Data distribution/position location.
Survivability.
Interoperability.

This slide reflects the current shortfalls as we see them. We feel that we are making good progress in these areas and without the intelligence, the ability to communicate that in a timely fashion to effect targeting, the ability to shift the combat power and to plan, act and react, the synergistic effect of all of the sophisticated weaponry we have will not be brought to bear at a critical time and place.

Do you have any questions, sir?

Senator GOLDWATER. No. I am anxious to hear you develop this a little bit.

COMBAT SERVICE SUPPORT, & C3I
(DOLLAR AMOUNTS IN MILLIONS)

SYSTEM	IOC	FISCAL YEAR 1983 RDTE	FISCAL YEAR 1983 PROCUREMENT QUANTITY	FISCAL YEAR 1983 PROCUREMENT AMOUNT
VIPER ANTITANK ROCKET	FY 83	0	86,000	$107.4
BLACK HAWK HELICOPTER (UH-60)	FY 80	0	96	733.0
CHINOOK HELICOPTER (CH-47D)	FY 84	0	24	265.3
HIGH MOBILITY MULTIPURPOSE WHEELED VEH (HMMWV)	FY 85	2.7	1,180	38.6
COMMERCIAL UTILITY AND CARGO VEH (CUCV)	FY 83	0	13,425	183.4
SINGLE CHANNEL GROUND & AIRBORNE RADIO SYS (SINCGARS)	FY 85	17.9	450	19.8
POSITION LOCATION RPT SYS (PLRS)	FY 85	9.4	*2/165/385	32.4

* MASTER STATIONS/USER UNTS/INSTALLATION KITS

General MERRYMAN. This shows the remaining systems that we will discuss this morning. You will see all of these numbers and all of these titles again.

Senator GOLDWATER. Just a moment.

Viper

	Millions
Fiscal year 1983 weapons system procurement request	$107.4

Provides the soldier with an improved, manportable means of defeating enemy armor.
Fiscal year 1983—3d year of production.
Total buy—648,400.
61,400 procured through fiscal year 1982 FDP.

General MERRYMAN. The first system is the Viper. Viper is a short-range, lightweight antitank rocket that we are procuring to replace the M72 light antitank weapon (LAW). The LAW has been in our inventory for almost 20 years. By comparison, this particular weapon provides greater lethality, and longer range. For example, it fires at 300 meters, versus the 150 meters for the LAW. It penetrates 40 percent more armor: [deleted]. It is faster and as a result has a higher hit probability [deleted] at 250 meters.

Senator GOLDWATER. Haven't you had some problems with this weapon?

General MERRYMAN. Yes, sir. We have had several problems with the weapon and I am pleased to report that, to the extent we know,

the technical problems have been resolved. These technical problems, for example with the firing mechanism, and launch tube separations under extreme cold conditions, those have been corrected. It was formerly bonded with adhesive. Ultrasonic bonding techniques have been developed and applied with success.

The launch tube separated during OT–II, which dictated an eight layer overwrap that we added to the outer tube. This fix has been successful; and launcher tube safety certification tests have been made (160 rockets); 400 additional rockets were fired during OT–II.

We had 15 percent duds in the initial warheads. This resulted from excessive tolerances between the fuze starwheel and the pallet. We replaced the wiring harnesses to meet the specifications.

In addition, we had a noise problem that has been corrected.

Senator GOLDWATER. What is the unit cost now?

General MERRYMAN. $959 is the average recurring unit cost in fiscal year 1983 dollars.

Senator GOLDWATER. $959?

General MERRYMAN. $959, fiscal year 1983 dollars.

Senator GOLDWATER. Haven't you had quite a bit of cost increase in this weapon?

General MERRYMAN. Yes, we have. I have with me, sir, my Director of Combat Support Systems, General Skibbie, who is responsible for this weapon system. He can talk about it at length if you would like.

Senator GOLDWATER. I wonder if the Army has evaluated any foreign systems, such as Swedish and British weapons?

General MERRYMAN. We haven't done that yet, but we plan to do so. The Congress directed that we look at alternative weapons and we are going to do that. The game rules were that within 90 days of the contractor telling us they want us to test their weapons, we would do so and report back to Congress 60 days thereafter.

Senator GOLDWATER. We have heard a rumor that the specs for this will be written to eliminate foreign competition, one is too heavy and the other was too long. Is that true, that certain things have been eliminated?

General MERRYMAN. They have not been written as you described. We recently had a general officer forum to determine what the specs should be, and General Skibbie can address that, as he was my representative.

General SKIBBIE. I would be happy to address that, sir, because it can be misleading in some ways.

The Army's requirement is for a lightweight anti-armor weapon. LAW, the system that Viper replaces, weighs approximately 6 pounds. The idea is that Viper can be proliferated throughout the entire Army and not just the frontline soldier. Soldiers in the rear, clerks and cooks, and logisticians also have need for this type of a weapon in case of a breakthrough, or for rear area security against guerrilla forces. Therefore, we feel a requirement to have it maintained as a light weapon. That has been one of our continuing objectives.

We were directed by the Senate Appropriations Committee to evaluate competing foreign and domestic systems, and we fully intend to do that. In fact, we strongly support that evaluation be-

cause we feel that it puts a competitive pressure on our current contractor, General Dynamics.

We have paired up with the Marine Corps because their requirement is for a much heavier anti-armor system. The Army will test the light end of the spectrum and the Marine Corps will test the heavy end. We have made 14 pounds the break point between the light and the heavy tests.

The major foreign competitors, are the improved Norwegian, LAW, and the German system. Both of those systems weigh under the 14 pound limit. The maximum weight we will consider for a light anti-armor systems. There are other anti-armor systems, but they cannot be considered light. These systems range into the 18- to 23-pound weight class.

The Marines have a different force structure and they are willing to devote a dedicated gunner to each one of their antiarmor systems. The Army is not willing to dedicate a soldier to the light antitank role because it requires putting an additional man in each squad. Furthermore, a heavier weapon means that a soldier can only carry one, as opposed to two in some cases.

So, we fully support the competition and we are going to energetically pursue it and we are not in any way constraining the specifications to exclude reasonable competitors. In my negotiations with the Senate Appropriations Committee I believe we achieved agreement that we will still be looking for a light system, and we would consider any system that was reasonably light.

Senator GOLDWATER. Will the Viper defeat a Soviet tank head on?

General SKIBBIE. [Deleted.]

Because of its weight, that size weapon [deleted] must be considered a medium or heavy weapon. Soldiers will tell you that they don't feel it would be realistic to proliferate those size weapons throughout our force structure.

Now, one of the things we need to consider in defeating tanks is that roughly two-thirds of the shots with light antiarmor weapons come from either the side or the rear. When you are firing at a tank at a distance, as you would be with a tank gun, at 2,000 to 3,000 meter range, yes, you are going to get a frontal shot.

When you are firing at a medium range with an antitank guided missile, you may have also a chance of getting a frontal shot. Once that tank gets close in—and here we are talking of the 200 or 300 meter range—the odds are that it is going to be maneuvering and will offer side shots. In Vietnam two-thirds of the shots were side or rear. In the Yom Kippur war, two-thirds of the shots were to the side or rear; and in our, computer war games, the same frequency or ratio shows up. Therefore, we think we are reaiistic in accepting a light weight system rather than pushing for one that punches through heavy armor.

The lighter systems that advocates say can punch through the heavy armor of a Soviet tank, may be able to punch through the [deleted] but not the [deleted]. Therefore, they will soon be in the same position as the Viper is now.

Senator GOLDWATER. What you are talking about are the [deleted] and in the discussions we have had I have questioned that

the Viper will handle a tank head on or from the side or rear where there may be a chance that the foreign LAW can handle it.

Frankly, the weight argument, I think we could live with a heavier weapon if it had to be heavier to get the armor penetration. The main trust of my position or argument is that we shouldn't exclude the foreign weapons if the foreign weapons are superior to what we have. While I can understand the desirability of a 6-pound weapon, if it isn't going to stop a tank it isn't worth much.

As you go to a 20- or 25-pound weapon, it will stop a tank and you can put two men on it.

General SKIBBIE. One thing I omitted to say is that Viper is only one element of the antitank suit of weapons. Artillery, tanks and antitank guided missiles can fire antitank projectiles at longer ranges. At the medium range is the Dragon, and then only at close range we depend upon a Viper or a LAW. The current Armbrust does not even have the capability of the Viper. The current Norwegian LAW has much less capability than the Viper, although in both cases system proponents say that they can product improve them. We will be more than happy to test those product improved versions. We will oversee the Marines' test of the heavier weapons and if it appears desirable, we will certainly consider those for adoption.

Senator GOLDWATER. These are not in production yet?

General SKIBBIE. The fiscal year 1981 buy was the first production of Viper and that contract was signed in December of last year. The fiscal year 1982 contract was signed shortly thereafter. There were strings on the money by the House and Senate Appropriations Committees until we completed correction of the technical problems that General Merryman mentioned. Those technical problems were satisfactorily corrected and when the money was released to us, and the contracts were signed.

RATTLER PROGRAM

Senator GOLDWATER. Would you explain the Rattler program?

General MERRYMAN. The Rattler, which you heard referred to last year as the improved manportable, antiarmor weapon system (IMAAWS), would be a replacement for the Dragon. As General Skibbie mentioned, there is a suit of antitank weapons. You have the Tow, and Hellfire for the long-range requirement. Then you have the Dragon, which is the medium range; and the one that General Skibbie and you have been discussing is the Viper, which is effective up to 300 meters.

"Rattler" is the name we have given to the system we are looking at to replace the medium-range Dragon, which is already in the field with the troops. We haven't decided what its range should be, but we are looking at things [deleted]. Rattler would be somewhere in the middle.

Senator GOLDWATER. Is that in production?

General MERRYMAN. No, sir; it is finishing in conceptual development at this time.

Senator GOLDWATER. What do you think of it?

General MERRYMAN. We have run into some problems this past year in trying to sort out within the Army what we want to do about a medium weapon. We have run into the same problem that you have hit upon as regards Viper. If you develop a weapon that will shoot far enough and penetrate the front end of a tank, at a range of [deleted] meters, you have a pretty sizable weapon that can tie up a lot of people.

We have to make a judgment now as to what size weapon we can live with and its capabilities. What that really means is that a smaller weapon is less capable than a larger one. Rattler must fit in between.

Senator GOLDWATER. Well, these weapons aren't armor-piercing; if they are not, I don't think that they are worth much.

General MERRYMAN. What you learn when you look through the historical examples—Vietnam and the Israeli wars, some 60-some percent of the close-in shots have come from the side and the rear.

Senator GOLDWATER. I can understand that, but the modern Soviet tank is probably fairly well armored on the sides and certainly would be on the rear.

General MERRYMAN. But our information tells us—and I don't believe there is any doubt—[deleted].

Senator LEVIN. You are saying that two-thirds of the time [deleted].

General MERRYMAN. That is correct.

Senator LEVIN. And what percentage of the tanks are the newer Russian T-72s?

General SKIBBIE. When Viper is fielded in 1983, [deleted].

Senator LEVIN. How about the 1990's?

General SKIBBIE. By that time the majority [deleted].

Senator LEVIN. What was the original unit cost of this, projected in 1983 dollars?

General SKIBBIE. In 1983 dollars, you mean?

Senator LEVIN. So that we can compare it. Will you get to it in a later slide?

General SKIBBIE. I have it right here, sir. In 1983 dollars, the original, the design-to-unit production cost, was $400. Now, you heard the 1978 dollars discussed, but they were escalated, to 1983 dollars. As we mentioned, Viper will cost in the vicinity of $900, but that design-to-unit production cost was based upon a quantity of 1.7 million rounds. We are going to buy approximately one-third of that number now, and with the changed cost/quantity relationship, the estimated design cost would be approximately $500 in 1983 dollars.

Senator LEVIN. It has just about doubled then in cost.

Senator GOLDWATER. What would this same type of weapon cost in Europe?

General SKIBBIE. There is no same type of weapon in Europe, sir. The European weapon that you hear mentioned is the Norwegian LAW, and they quote a cost of about $280 for that in 1983 dollars, and yet that is the same LAW that we have, the same design and the same armor penetration of [deleted] inches, and it won't penetrate the [deleted]. That is why we need to buy an improved weapon.

ARMBRUST

The other existing antiarmor light weapon is the Armbrust, and it has a very low probability of penetrating the [deleted] and the cost is $500 per copy as it sits right now.

Senator LEVIN. Will it penetrate the [deleted]?

General SKIBBIE. It has basically the same capability as our current LAW, and the Viper has a three to five times greater single shot kill capability compared to the LAW or compared to the Armbrust.

Senator LEVIN. That is [deleted] three to five times?

General SKIBBIE. Yes.

Senator LEVIN. All right; that is all I wanted on that.

General MERRYMAN. What I put up on the screen are the current estimates.

Senator LEVIN. I have one other question on the Viper concerning the timetable. Is there a certain time limit after you are notified that the manufacturers are ready to make a bid?

General SKIBBIE. Congress directed that we commence testing 90 days after we are notified of their readiness to provide rockets.

Senator LEVIN. Have those manufacturers been made aware of the fact that we are waiting for them to notify us?

General SKIBBIE. First of all, we felt it would be unrealistic to go out and say to all manufacturers, "We are ready to test your weapons," simply because we are not ready to test all weapons. We are only interested in a light antiarmor weapon. So we have developed an envelope within which is prescribed an antiarmor weapon. We are now about to release a request for proposal. When released, the proposal will start the clock running. Thereafter, if any manufacturer has 50 or 60 weapons to test, we will be happy to test his weapons 90 days subsequent to his notification to us that he has those weapons available.

Senator LEVIN. How much time will you give the manufacturer for that request after the request for proposal?

General SKIBBIE. I don't think we are going to limit the time that they will have to notify us, other than the fact that Congress directed us to have these tests completed by the 31st of July 1983. So, backing off from that, 60 days to write the report and at least 60 days for the conduct of the tests, plus 90 days to get started is 7 months. Therefore, it would have to be at least 7 months prior to July of 1983.

I would emphasize that we really strongly support that competition because we think it puts competitive pressure on General Dynamics. Their vice president has come to me and informally said that he is committed to cutting the cost in half and increasing the capability of the Viper by a factor of two. So they already feel the pressure and they are putting their own money into improving the system.

I think it is a result of what Congress has directed us to do.

Senator LEVIN. How much is the British LAW?

General SKIBBIE. It is not in production and they quote a price of $1,140. However, all of these costs, as you must realize, are manufacturers' claims, in the same sense that our own manufacturers are merchandising their weaponry, so are the foreign manufactur-

of reasonableness. The effects of a fixed price contract, if we have done a good job of cost estimating and negotiating, are increased program stability and subsequent cost avoidance. It motivates the contractor to deprive more realsitic costs earlier in the cycle and eliminates cost growth. I want to emphasize that fixed price is not a panacea and that the Army is not unwilling to share risk at appropriate junctures in a program.

General MERRYMAN. Yes; that is a very good question.

Senator LEVIN. Let me check it out, to see if you can provide that sort of historical evidence when you change, or if you can compare it on some other basis.

Is there any other reason except saving money?

General MERRYMAN. That is all.

Senator LEVIN. How are you going to implement this new emphasis; is there a new directive to you?

General MERRYMAN. There has not been a directive. It is an emphasis that stems all the way from the Secretary of the Army and permeates the acquisition community. Let me give you an example:

Whenever we sit in our forums and try to decide what to do about acquiring a system, one question you can always count on, either from the Under Secretary or the Assistant Secretary or the Vice Secretary, is that question: "If the contract isn't a firm, fixed-price, why not, and why are you on cost plus?" The same thing stems up from OSD when you brief the Under Secretary of Defense for Research and Engineering (Dick DeLauer). Anything other than something associated with fixed price had better be explained.

Dr. SCULLEY. In general, Senator Levin, I feel that moving into the fixed-price arena, to include fixed price incentive, is a better way of sharing the risk between the Government and the contractor. We have consciously decided to move away from cost-plus contracts when feasible. It is also my declared policy to move away from letter order contracts. In the future letter order contracts will be by exception. Furthermore, we will seek earlier definitization between the Army and the contractor on any letter order contracts that do exist.

I would caution that fixed-price contracts are not a cure-all. If the risk is high, a cost-plus type would be a better instrument. So it is not a cure-all across the board. It is just an intention toward a more equitable sharing of risk between the private sector and the Army.

Senator LEVIN. While you are talking about that, let me ask you a few questions on a different subject, if the chairman will bear with me. I was going to try to do this while he was gone, and now he is back I will have to ask him.

ADMINISTRATIVE-USE VEHICLES

This is on administrative-use vehicles.

Do you or any of your colleagues know how many vehicles are in the 1983 budget for nontactical administrative-use vehicles?

General SKIBBIE. 6,839 is the number of nontactical vehicles that we are requesting in the 1983 budget request, which amounts to $78.1 million.

Senator LEVIN. Are you the purchasing agent for other services for administrative vehicles?

ers merchandising or marketing their weaponry. They claim the price is $1,140.

It is also still in the developmental stage, and so I really can't say how much it is going to cost.

Senator LEVIN. All right, let us go ahead.

Are we dual-sourcing the Viper?

General SKIBBIE. No; we are not at the present time.

Senator LEVIN. Should we be?

General SKIBBIE. First of all, we have already spent $60 million to facilitize for the production of Viper. We feel we are going to a fixed-price contract in 1983 and when we entered the negotiations for 1982 we required that General Dynamics give us a not-to-exceed cost for fiscal year 1983.

Perhaps Dr. Sculley would comment more on the fixed price versus the multiple source.

Dr. SCULLEY. We feel because of the facilitization dollars that we have put into General Dynamics, that we have moved from a cost-plus to a fixed-price contract, and the quantity that we expect to produce, that it is inadvisable at this time to second-source Viper. We believe that we will get the desired competition through the testing program directed by the Congress.

Senator LEVIN. While we are on the cost-plus/fixed-price issue, yesterday General Merryman said that the Army was implementing a policy to reduce the number of cost-plus contracts, and to award the fixed-price-type contracts in their place wherever possible. Why are you doing that?

General MERRYMAN. To save money, sir, to try to get more control over the programs.

Senator LEVIN. What was the policy of the Army in the past relative to that?

General MERRYMAN. I don't think it was any different. I think I probably should have said "emphasize" rather than "change" in policy.

Senator LEVIN. Are you able to demonstrate that you can save money that way?

General MERRYMAN. I think under certain conditions, yes. If you have a very risky program up front, it would probably be risky to change to a fixed price contract. If you have a program that is fairly stable, a fixed price contract makes a lot of sense. So it is a matter of judgment and the stage that the program is in, sir.

Senator LEVIN. How would you go about proving that firm, fixed price saves you money after you have a stable program?

General MERRYMAN. The only honest answer that I can give you here, would be based on subjective judgment.

Senator LEVIN. Can you prove it from cost records?

General MERRYMAN. I believe that it could be proven by looking back at historical examples.

Senator LEVIN. It might be interesting if you could supply those for the committee.

[The information follows:]

COST SAVINGS FROM FIRM FIXED PRICE CONTRACTS

General MERRYMAN. An investigation of cost records will not provide empirical proof that fixed price contracts save us money. The concept does, however, pass tests

General SKIBBIE. It varies by load class. In some cases we are and in some cases we are not. The GSA has some of the light-load classes. We buy some vehicles for the Air Force and the Marine Corps.

Senator LEVIN. Some of the Air Force and the Marine Corps vehicles could be part of the 6,839 figure?

General SKIBBIE. They could be, however, I can't give you a definitive answer.

Senator LEVIN. Do you think that American vehicle manufacturers should be permitted to compete for these contracts to provide administrative vehicles?

Dr. SCULLEY. Our past experience shows that it has been most advantageous to purchase vehicles of this type in the country in which they are being used.

Senator LEVIN. You say you save money or there are other reasons?

Dr. SCULLEY. It is not just a money argument. I think it is also due to time, availability of parts, and the ability to contract maintenance for the vehicles. I would also add that it was a position that was taken at a time when we were not feeling the effects of the economy on our own automobile industry, and I think it now warrants a relook.

Senator LEVIN. Last year we added a provision in the Congress that states that our own automobile manufacturers should be able to compete. Are you going to object to that provision this year?

Dr. SCULLEY. I would ask that I could provide that answer to you.

[The information follows:]

Dr. SCULLEY. In the interest of cost effectiveness, interoperability, and standardization, the Department of Defense established the Non-Tactical Vehicle Off-Shore Procurement Program for Germany, the United Kingdom, and Italy.

The Non-Tactical Vehicle (NTV) program, formerly the Administrative Use Vehicle (AUV) program, has proven to be particularly beneficial to our forces in Germany since the vehicles we have purchased in Germany enjoy a very high rate of operational readiness and have reduced considerably the logistics maintenance burden. Unfortunately, our estimate is that the opening of these procurements to competition will, in fact, not benefit our U.S. automotive industry as intended. In actuality, though the dollar amounts for the German procurements may appear large, when it is recognized that this dollar amount is divided among various vehicle body styles such as carryalls, trucks, and others, it is much less attractive. We foresee the most likely result as a proliferation of foreign makes and models within the European fleet, degradation of logistics support and, again, no benefit to the U.S. automotive industry. I might add that we do not intend to extend this program beyond those three countries where currently approved. We certainly hope that the 1983 Appropriation Bill does not include the restrictive legislation that was included in the 1982 Bill as it adversely effects our agreements with the Federal Republic of Germany as well as the support of our own forces stationed in Germany.

Senator LEVIN. It is really extraordinary. I guess I am more aware of some of your problems than others; however, if you tell unemployed auto workers that their firms cannot even compete for American purchase of classed automobiles, you will have quite a problem. There is no way that we can justify not allowing competition.

When we talk about "buy American," we have provisions which require us to buy American in textiles and variety of other items. I am going to offer an amendment which says we will treat automobiles the same way we treat textiles. That is one issue.

I can understand the objection, but I can't understand the objection to at least allowing our own manufacturers to compete. If they are not the low bidder, they are not the low bidder. I would hope that the Army and DOD would at least accept the provision we added last year and not fight it this time around. That provision states that American manufacturers should be allowed to compete for the purchases by DOD of administrative-use vehicles. Anything less than that, I think, is insulting. It is our own companies and to our own workers advantage.

We have 6,800 vehicles here and in the 5-year plan—that is just for 1983—do you know how many are in the 5-year program offhand?

General SKIBBIE. I don't have the 5-year total. I can give it to you for 1981 through 1984; it would be roughly 31,000 vehicles. However, those are nontactical vehicles, Senator, and I think the ones that you are referring to would only be a very small subset of that. That would not be the vehicles that we were originally bidding in Germany—originally, we were bidding vehicles in Germany to be used in Germany—and that would be only a small subset of that total.

Senator LEVIN. If you could give us those figures for the record, as to what percentage of that total figure was restricted to foreign competition——

General SKIBBIE. Yes, sir.

[The information follows:]

General SKIBBIE. For the 5-year program, fiscal year 1983 through fiscal year 1987, the Army plans to procure approximately 51,296 Non-Tactical Vehicles for $687.8 million. The percentages programmed for off-shore procurement in Germany are 11 percent of the vehicles and 10 percent of the dollars.

Senator GOLDWATER. Aren't you talking about staff cars?

General SKIBBIE. We have never bought staff cars overseas. We have always purchased staff cars and sedans in the United States.

What we were talking about buying overseas were carryalls, light pickups and those nontactical vehicles used around posts, camps, and stations overseas. They are relatively low density items, and studies proved that it was clearly advantageous pricewise, to buy abroad because the vehicles could be maintained commercially by contract, parts were available there, and you save in a lot of ways.

We readily accept the economic situation in the United States and I can understand your feelings.

Senator LEVIN. Just let them compete. If you can save money, you ought to be able to proffer it in open competition.

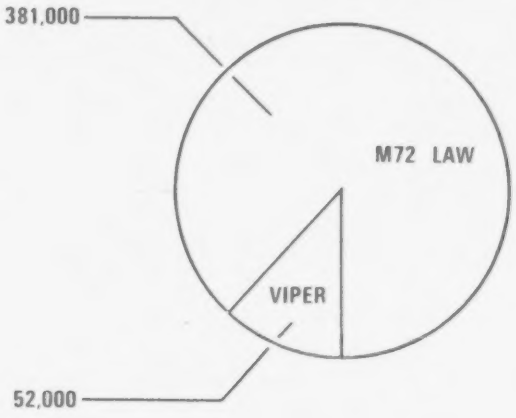
General SKIBBIE. However, if we open up to competition you also open it up to other countries, and so you might end up getting Italian vehicles in Germany and German vehicles in Italy, and that would not be cost effective.

Senator LEVIN. Just open it up at least to our own manufacturers and the Germans and Italians in Italy and give us a chance to compete. This is a further question where we ought to be more restrictive under these economic circumstances and handle cars the same as we do textiles. However, that is a different level of discussion. I would hope that the DOD this year would not object to al-

lowing our manufacturers to compete and if you save money, you will be able to prove it in open competition.

Thank you, Mr. Chairman.

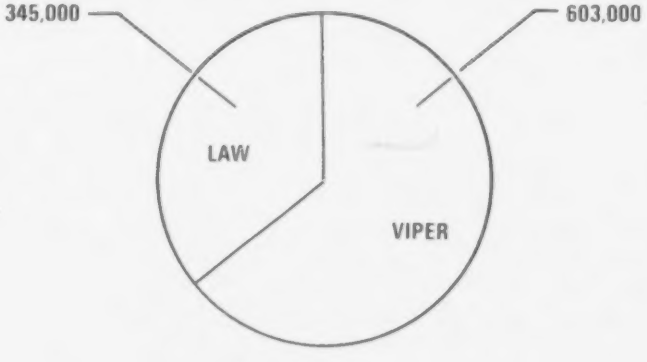
VIPER/LAW ASSETS - END FY 82 FDP



TOTAL ASSETS: 433,000

General MERRYMAN. The next chart shows the number of Vipers at the end of fiscal year 1982.

VIPER/LAW ASSETS - END FY 87 FDP



TOTAL ASSETS: 948,000

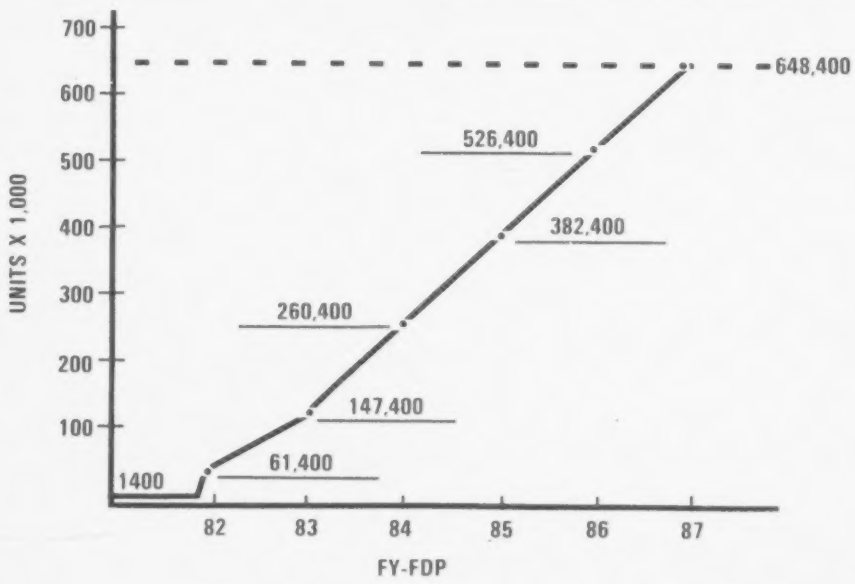
This chart shows the assets at the end of the fiscal year 1987 funded delivery period.

VIPER FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement of 86,000 rockets.

This chart shows what the 1983 dollars would buy.

VIPER PROCUREMENT OBJECTIVE



This chart shows how we would proceed to buy out the procurement objective.

VIPER -FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E	61.9	0	0	0	0	61.9
$ WPN SYS PROC	18.8	87.2	107.4	122.4	372.0	707.8
QUANTITY BUY (x 1000)	1.4	60.0	86.0	113.0	388.0	648.4

$(000,000)

Blackhawk UH–60A

	Millions
Fiscal year 1983 weapons system procurement request	$733

Provides capability to move troops, equipment and supplies during day, night, and adverse weather.
Fiscal year 1983—7th year of production.
Total buy 1,107.
433 procured through fiscal year 1982 FDP.

The next system is the Blackhawk or UH–60, which with the fiscal year 1983 dollars, will enter the 7th year of production, the total buy is 107 and we will have procured 433 through 1982. I think you are both familar with the Blackhawk, truly the first helicopter that can carry a full infantry squad under just about any environmental conditions. There are two 1,500 horsepower engines. Have you flown it, sir?

Senator GOLDWATER. Yes: I have flown it.

General MERRYMAN. It was a different transition to our students than anything we had ever seen before.

Senator GOLDWATER. It is a great aircraft. How many troops can you put in the back end of it?

General MERRYMAN. You have 11 seats, but if you and I were going into combat, we would take the seats out to make more space because it will lift anything you can put in it. It will cube out before it grosses out and still handles easily. It is as agile as a grasshopper.

Senator GOLDWATER. This is beside the point, but have you seen or flown the newest Sikorsky?

General MERRYMAN. The advancing blade concept (ABC), you mean?

Senator GOLDWATER. Yes.

General MERRYMAN. No, sir; I went out there to fly it and that is when they crashed their first model, about 8 years ago, and so I have never made it back to do it.

General PARKER. I have flown it; it is an extremely impressive technology demonstrator and, of course, that is what it is at this point in time. Your imagination could run away with you if you think what you might be able to do with a composite fuselage that would reduce the weight by about 22 percent, and composite rotary blades and advanced technology engines. It also has growth potential. When we consider that the machine that you and I had the opportunity to fly had a lot of 1960 vintage technology in it, and could still perform the way it did indicate great potential that we cannot ignore. It is one of the candidates that we will look at very closely in the joint vertical lift helicopter program that we have ongoing currently.

XV–15 TILT-ROTOR

Senator GOLDWATER. As long as we have got back on track, I got to fly the XV–15 tilt-rotor recently, and I am wondering if the services are taking a look at that?

General MERRYMAN. I flew the simulator out in California.

Senator GOLDWATER. I will tell you, it is a revelation, to take off vertically and tilt the rotors over, and you are doing 300 knots very

quickly, I am wondering about the military possibilities. It is a big machine.

General MERRYMAN. We have a joint program with the Marines and the Air Force and the Navy that just got started. We were chartered the last day of 1981. General Parker is very much involved and the Army is the executive agent for the program. Hopefully, this program will develop an aircraft that would provide a trooplift aircraft for the Marines early in the 1990's, a search-and-rescue aircraft for the Air Force, and perhaps a special electronics mission aircraft (SEMA) that is something along the lines of a Mohawk follow-on, for the Army. We are working with the other services right now.

Senator GOLDWATER. It is a very impressive aircraft. They are working on a 64-seat model to use between cities. I can see a need for that in the military, but I just have some question now as to its value as a weapon carrier. It is so big, you could hit it with a rock.

General MERRYMAN. We have never seen it as a weapon carrier. The joint service would lead to the development of an aircraft that wouldn't need an airfield an would fly a long time without refueling. The aircraft would carry sophisticated electronics aboard that would pick up communications emitters and radars. This concept looks very good to us. By the time that such a development could be completed, our Mohawks would be about 30-plus years old. If we can put our electronic systems in this new aircraft instead of a helicopter, we will be able to stay up there longer and can still operate without an airfield. So, you get the best of both worlds.

Senator GOLDWATER. I hope you will keep me posted. When you make progress, I would like to know about it.

General PARKER. If I could make one comment concerning the Blackhawk, because I know you were interested in the perception that we are increasing the complexity that is being designed into our systems which would seem to make them too difficult to maintain and operate. We are looking at that matter now through an indepth study and analysis. Blackhawk happens to be one of those systems we selected, and the emerging results reveal that we can design a very complex and very capable machine like the Blackhawk, but the personnel who maintain and operate it say it is easier and less complex to maintain and to operate than its predecessor. We are very proud of that. We can't make the same claim for all our systems, but here is a case where we can design complexity and still make a system maintainable and operable.

Senator GOLDWATER. This has a very high rate of availability, has it not?

General PARKER. Yes. At this point it needs maturity but it is exceeding our expectations. We had some initial provisioning problems with spares and repair parts. The machine is capable of a far higher mission capable rate than any system we have in the field. On a recent trip to Bright Star we maintained it at above the 95 percent operational rate.

Senator GOLDWATER. That is very good.

Senator LEVIN. Before you leave the Blackhawk, is there a reprograming request for the Blackhawk?

General MERRYMAN. I am getting to that, Senator Levin.

Senator LEVIN. Are you going to show us the savings in the multiyear contract?

General MERRYMAN. Yes.

Senator LEVIN. Has that request come in?

General MERRYMAN. No. I sent the letter to the Chairman yesterday.

Senator LEVIN. And will you then be needing less advance procurement money in 1983?

General MERRYMAN. I can go ahead and address it at this point.

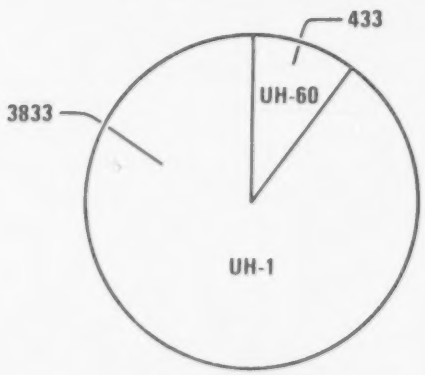
Senator LEVIN. Is that a part of your presentation?

General MERRYMAN. What we are trying to do as far as multiyear is concerned, is to get multiyear procurement for 1982, 1983, and 1984. We were turned down in the last Congress on our initial request. We were able to, by the time the session ended, though, get some agreement that we could come back and ask again.

That is what we will do. Now, what it consists of is this: We need in fiscal year 1982, $69.4 million that would have to be programed into the account; $34.9 million would have to come from an outside source, and $34.5 million would have to come from the Blackhawk procurement line.

If we get the Congress to OK that, we will save $81.4 million over that time period. If we get your permission for a multiyear contract, our fiscal year year 1983 budget request will be in excess of our requirement. Let me get to it and then I will break it out and show you.

UTILITY HELICOPTER ASSETS - END FY 82 FDP



TOTAL ASSETS: 4266

Senator GOLDWATER. What is the unit cost now; do you know?

General MERRYMAN. The average unit procurement cost, in 1983 dollars is 5.7 million.

Senator GOLDWATER. That has gone up quite a bit, hasn't it?

General MERRYMAN. Yes, sir; but not recently. I venture to say we probably have a better handle on this system cost now than any

other. But we had real problems during the initial years of development Those problems resulted from several things, but the primary reason is that we continually had to revise the cost estimates.

After we had built the first couple of helicopters, we knew what it would cost, or actually Sikorsky knew what it would cost. Therefore, the numbers we are now giving you are based on what we have learned; the actual cost to produce the bird.

Sikorsky is so sure they can produce the bird at less dollars that we are going to go—firm, fixed price in the future with a multiyear contract.

Senator GOLDWATER. They are a very reliable manufacturer.

General MERRYMAN. Yes, sir. Here again, Senator, I hate to infer that the Army, and its manufacturers don't know how to estimate costs early on. Unfortunately, many of the skills that make up an Army, cost estimating capability don't exist out there and, in many cases, they haven't been produced before. You are very much aware of what Sikorsky did when they developed the Blackhawk. It literally was one of the first helicopters designed to be a helicopter. If you go back to just about everything prior to the Blackhawk you will remember that we literally created helicopters around an engine. You took the engines left over from World War II and put a fuselage around it and that was a helicopter. It was the old Corsair engine.

But Blackhawk was literally created from the ground up as the kind of helicopter that the Services needed, and they found out that they couldn't do a lot of things for the cost they first stated. It took them several years literally to find that out.

There were other problems, with management of the plant and the production line was not efficient.

Senator GOLDWATER. We had a tough time getting the Army to buy that.

General MERRYMAN. I can tell you that the Army is very happy that they are buying the helicopters.

Dr. SCULLEY. I might add, in a recent visit that I made, prior to forming a personal position on multiyear, I was most impressed with the production facilities at Sikorsky. I also was very impressed with the track record of the new management of Mr. Daniel at Sikorsky.

I personally think that the Blackhawk will be to rotary wing aviation what the DC–3 or C–47 were to be fixed wing 50 years ago.

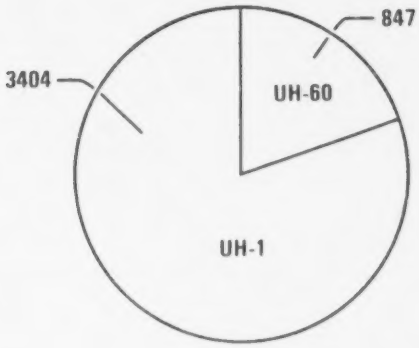
Senator GOLDWATER. I didn't know you were a graduate of VMI.

Dr. SCULLEY. Yes, sir, I was honored to hear your address last May 16, sir.

Senator GOLDWATER. It is a great school.

Dr. SCULLEY. Thank you.

UTILITY HELICOPTER ASSETS - END FY 87 FDP



TOTAL ASSETS: 4251

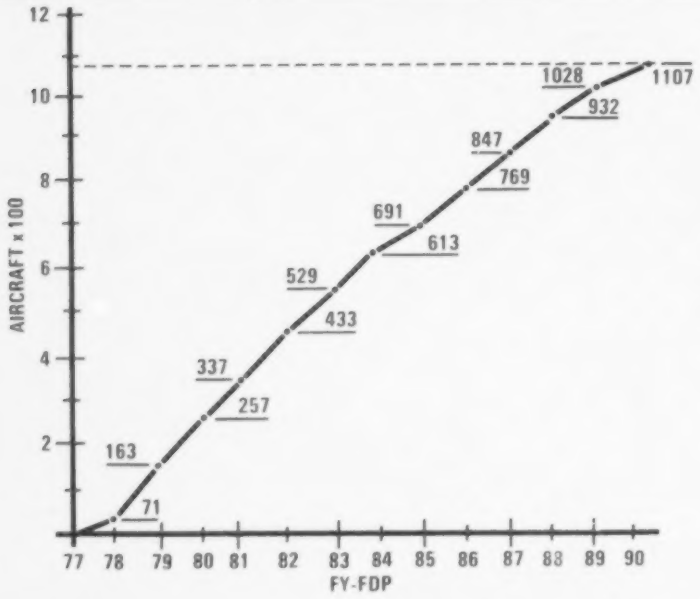
General MERRYMAN. This chart shows the assets at the end of fiscal year 1987.

BLACKHAWK FISCAL YEAR 1983 BUDGET

Provides for:
Procurement of 96 aircraft.
Termination liability of expanded advance procurement, fiscal years 1983-85 multiyear program.

This chart describes what the 1983 dollars are for, providing 96 aircraft.

BLACK HAWK PROCUREMENT OBJECTIVE



This chart shows you the procurement objective and how we would buy out.

UH-60 BLACK HAWK - FINANCIAL SUMMARY

PROGRAM UNIT COST
(CONSTANT FY 83 $)

DEV EST FY 71	4.99
FY 82	6.40
FY 83	6.35

COST GROWTH

FY 82-83	-.8%
TOTAL	+27.3%

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E	481.1	—	—	—	—	481.1
$ WPN SYS PROC	1645.8	613.0	733.0	545.8	3814.8	7352.4
QUANTITY BUY	337	96	96	84	494	1107

$(000,000)

Here is where I address the multiyear dollars. You will notice in the 1983 column we are asking for $733 million to buy 96 helicopters. There are also contingency dollars in there for 1983-85 multiyear front load funding in case we do not secure the Congress permission to buy 1982-84 multiyear. If we can get the 1982 permission, then $147.3 million of that $733 million are dollars we don't need.

Those dollars are in two budget lines and my experts told me to make sure that I tell you this. One is from advance procurement, that is, $61.7 million, and the other, $85.6 million, is from the procurement line. Those dollars would not be required by the Army if we can get permission to go with the 1982-84 multiyear contract.

Senator LEVIN. What is the timetable on your request for reprograming?

General MERRYMAN. I believe that the Office of the Secretary of Defense has the action right now.

Dr. SCULLEY. The Deputy Secretary of Defense has it, in fact.

Senator LEVIN. Do we have a certain number of days to disapprove it?

Dr. SCULLEY. There is a 45-day period after official request before the Army can proceed.

Senator LEVIN. Do we have to approve it, or do we have 45 days to disapprove it?

Dr. SCULLEY. I don't know the answer to that.

General MERRYMAN. I think the answer is that if we do not hear from you in 45 days, we can go ahead, but I am not sure, Senator Levin.

We will make sure.

CH-47D Chinook

	Millions
Fiscal year 1983 weapon system procurement request	$265.3

Improved medium lift helicopter.
Extends fleet life.
Provides tactical and logistical movement, replaces current CH-47 models.
Fiscal year 1983 3d year of Production.
Total buy—436.
28 modernized through fiscal year 1982 FDP.

The next system is the CH-47 Chinook. This is a modernization program as I am sure you are aware. Currently the Army has A models, B models, and C models. What we are going to call this one is the D model. What we do is take a 25-year-old helicopter—not all of them are 20 years old but we bought the first ones 25 years ago—and modernize so that it will be capable into the next century. Things we are doing are putting new fiberglass rotor blades on the system and taking the old hydraulic system and modernizing it. Have you flown a Chinook, sir?

Senator GOLDWATER. No.

General MERRYMAN. If you go in, it is a plumber's nightmare; you have the forward transmission with hydraulic tubes to something in the rear and vice versa. You need a plumber almost as much as you need a crew chief at times. This modernization will take care of that and get rid of about 400 electric points and reduce 200 tubes; it will improve the transmission and drive; it will improve the flight-control system; it will put three hooks on the outside so we can haul three loads out there, or one big load that won't sway.

One of our problems in the Chinook, thus far, is if you get something down there, under windy conditions the load will sway and it limits whether you can fly the helicopter or how much you can carry under it.

Senator GOLDWATER. Does each rotor system have the same power?

General MERRYMAN. Yes, sir; you have two engines in the back and the engines will be—right now they are 3,750 horsepower, and they will be improved to 4,500 each, and what you have is a transmission gearbox. They go into a mixing box which has a drive that goes up to the front rotor and a drive that goes to the aft rotor.

Senator GOLDWATER. Is there any way you can put engines up forward, too?

General MERRYMAN. You could, sir. Sikorsky built one for the Army in the early 1950's but the program was canceled after one of the prototypes crashed.

Actually, what the Marines currently have—the CH-46—is what Sikorsky built on its own following that crash. We went in and said we needed one a little larger. Thus, the CH-47, the current Chinook, was developed.

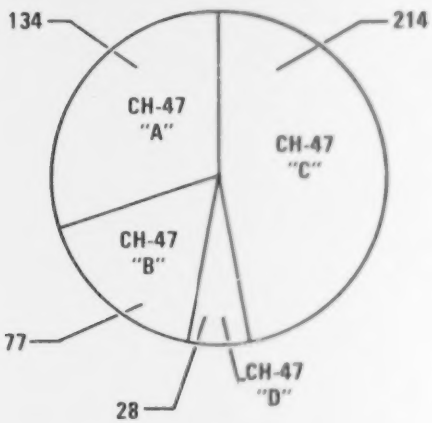
To my knowledge, they have never looked again at putting the engine in both ends. They put them in the back and use a mixing transition to get the power out.

Senator GOLDWATER. I think I saw the helicopters.

Sikorsky has more ideas than hair; I will tell you that.

General MERRYMAN. He did, sir.

MEDIUM LIFT (CH-47) ASSETS - END FY 82 FDP



TOTAL ASSETS: 453

This shows you where we are today, sir, with the A models, with the first one that came in in 1962, and the B's came in in the middle 1960's, and the C models came in in the late 1960's. And then you can see the pie wedge at the bottom, those are model D's that we would have at the end of the period.

Senator GOLDWATER. What is the total lift capability of this helicopter?

General MERRYMAN. You can lift 22 tons externally, and here it has 33 seats, as I recall. Here again, in combat I can remember some stories from Vietnam, some I believed and some I didn't, that indicated that 100 or 200 people were packed into the helicopter. You can put as many people in as there is space, and because of the power it has, the bird can lift it. It will cube out on a personnel load before it will weight out.

Senator GOLDWATER. What was the total tonnage?

General MERRYMAN. You can carry 22,703 pounds, 30 nautical miles radius, and have a 200-feet-per-minute vertical rate of climb.

Senator GOLDWATER. I think that it is the one they used to pour concrete on the bridge down in Annapolis.

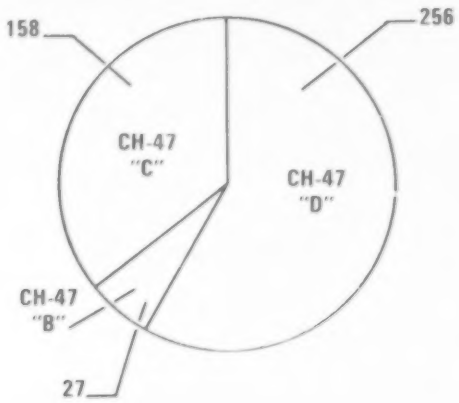
General MERRYMAN. It might not be the D; it was probably the C, the one on the right. That is my guess.

Senator GOLDWATER.That was really hairy piloting. They carried about 16,000 pounds of concrete over a hole and poured it.

General MERRYMAN. We had the C model which can haul 18,000, and that is probably what that was. This is a good example of product improvement, rather than building a new system. If you go back 20 years, when we first started buying this helicopter, it would lift 10,000 pounds. We currently can lift nearly 23,000 pounds, and in many ways it is the same helicopter. We just kept

adding things as we learned how to do them, in all honesty, instead of buying a new bird.

MEDIUM LIFT (CH-47D) ASSETS - END FY 87 FDP



TOTAL ASSETS: 441

This is what we would have at the end of the fiscal year 1987 period.

CH-47D FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Conversion of 24 CH-47's into "D" models.
Procurement of long lead items for 36 aircraft in fiscal year 1984.
Procurement of initial spares.

This shows you what the 1983 dollars would buy.

Senator GOLDWATER. Your main modification will be the new engines; is that right?

General MERRYMAN. No, sir. You will have new blades, and I don't have the exact specification on the blades, but I can give you some things. That is quite a change in itself. The new blades will withstand a 23-millimeter direct hit, for example. One thing that my boys didn't list here, but I think it is most significant, is the number of hours you can fly those new blades before you need to replace them.

You can fly them 3,600 hours, before you have to replace them. What I don't have here is how much the old ones are, but I know it is considerably less. The significance of that is that those blades cost an awful lot of money.

Senator GOLDWATER. Do you have any other blades that can go that long?

General MERRYMAN. I don't think so.

Senator GOLDWATER. I think the average is around 1,500.

General MERRYMAN. Dr. Sculley just told me that the current blades can go for 1,200 hours, and this will triple the number of hours.

Senator GOLDWATER. What are you making the blades out of?

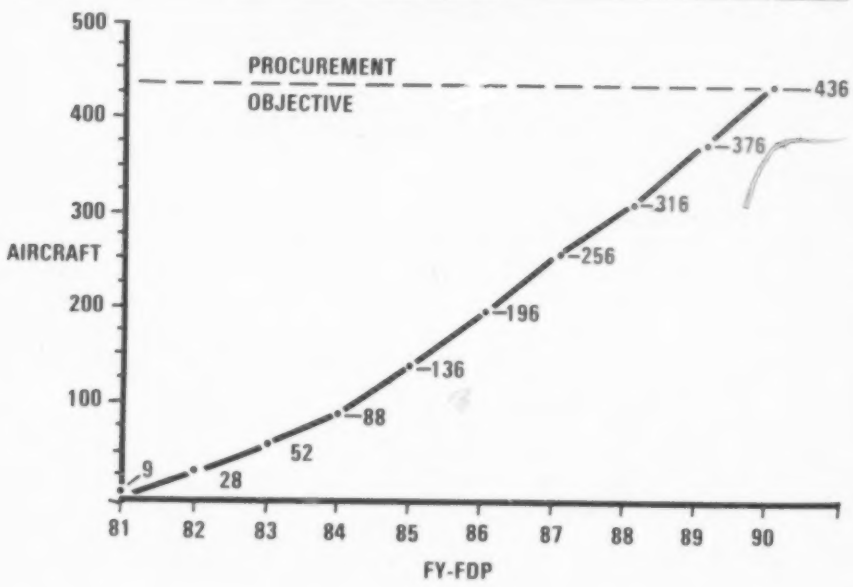
General MERRYMAN. Fiberglass.

General PARKER. We are putting that on the Cobra; we are putting it on the UH–60, and we will probably be putting it on all of our helicopters in the future; it is the way to go.

Senator GOLDWATER. What is the size of that rotor, the diameter or length of each blade?

General MERRYMAN. I don't know exactly the footage, but I would say the blade is as far as from me—you have three blades on each end to that fireplace, is that about right (indicating)?

CH-47D PROCUREMENT OBJECTIVE



CH-47D CHINOOK - FINANCIAL SUMMARY

PROGRAM UNIT COST
(CONSTANT FY 83 $)

DEV EST FY 76	4.93
FY 82	5.48
FY 83	5.66

COST GROWTH

FY 82-83	3.3%
TOTAL	14.8%

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E	113.6	—	—			113.6
$ WPN SYS PROC	184.4	231.3	265.3	352.0	2008.3	3041.3
QUANTITY BUY	9	19	24	36	348	436

$(000,000)

General PARKER. Yes.

General MERRYMAN. This shows how we would procure. This is your financial summary. You can see that the program unit cost originally was estimated at nearly $5 million in the upper left, and we are now at $5.66 million, and over at the right we show you that last year it grew 3.3 percent, and it has been a pretty darned good program.

Senator GOLDWATER. What is your total range empty; how far can you fly it?

General MERRYMAN. Let me see if I have got that. You can fly it at 160 knots, which is pretty darned good, and I have forgotten how much fuel it carries, Senator, but it seemed like you could fly empty about 3 hours, as I recall.

General PARKER. That is correct, and, sir, we are looking right now at the feasibility of self-deploying this aricraft to an overseas theater because with internal fuel modifications it will fly in the neighborhood of 1,000 nautical miles.

General MERRYMAN. We have already done that. We flew them into Europe.

General PARKER. We are conducting a feasibility study on self deploying the advanced attack helicopter, Blackhawk, and the CH-47, in an effort to offset a deficit in inter-theater lift.

Senator GOLDWATER. Can you refuel them in the air?

General MERRYMAN. I am not sure.

General PARKER. We don't have any aircraft currently adapted for in-flight refueling, but we do know that that is feasible and is part of the ongoing study right now.

General MERRYMAN. There are several concepts that we are studying. One of the things we are looking at is using the C-130 or

C-140 tanker with three or four helicopters flying behind it. Other concepts are having ships prelocated in the ocean that we could land on. However, we went across last time with internal fuel tanks and the boys went all of the way. A few hours after they were there they were out on a tactical maneuver which was refreshing.

High mobility multipurpose wheeled vehicle (HMMWV)

	millions
Fiscal year 1983 R.D.T. & E. request	$2.7
Fiscal year 1983 weapons system procurement request	38.6

Multipurpose, cross country tactical vehicle.
Complements CUCV program.
Fiscal year 1983—1st year of 5 year multiyear program.
Buy approx. 41,000 (1st multiyear contract).
None procured through fiscal year 1982 FDP.

The next program that I would like to describe is what we call the high mobility multipurpose wheeled vehicle [HMMWV], and the commercial utility cargo vehicle [CUCV]. These two systems are a pair of vehicles that the Army plans to buy, to meet the 5¼ ton requirements for the Army in the future.

In 1980 the Army submitted to Congress the results of the study that the Congress had asked us to conduct to determine what the most cost effective mix of wheeled vehicles would be in the Army.

The results of that study said that we needed 5¼-ton trucks, 5-ton trucks and 10-ton trucks. What I want to talk to you about today are the two complementary facets of these vehicles that we have selected that meet the requirements for the five- and ten-ton vehicles.

Now, these two vehicle families will replace the half-ton Mule, the 5¼ ton M-80 commercial truck, the 5¼-ton Goat, and a ¼-ton M-51 or Jeep.

Concurrently, the commercial program will implement the congressional directive that we commercialize 20 percent of our Jeep fleet. That is, to go—the congressional direction is to go and commercialize and provide vehicles for one of the weight classes chosen in the congressionally directed zero-based study and provide vehicles that meet congressional mix requirements in a cost effective manner.

The first chart [chart deleted] this shows you the six versions of the HMMWV. It will come in three body styles: utility, ambulance, and weapon-carrier. What you see on the slide, and I apologize that it is probably too small, is a TOW missile-carrier, an artillery observer, and air forward controller vehicle, a medical evacuation vehicle, another use for nuclear, biological, and chemical [NBC] reconnaissance and a front-line command and control vehicle.

The point I want to make here is that this vehicle is the one we would use up front in the tactical area and the other one I am going to show you is the one we would use in the rear. We have had an abbreviated R. & D. program started, three contractors, AM General, Teledyne Continental, and Chrysler Defense Industries. Developmental test/operational/tests begin in May and after 5 months we would select the winner, with an award in November or December of this year.

Senator GOLDWATER. Did you mention that America still is making the Jeep?

General MERRYMAN. They are making five-tons for us but I don't know whether they are making jeeps.

Senator GOLDWATER. Are we still buying from them?

General SKIBBIE. We are not buying any jeeps right now, and I think the Marines had a buy last year, and that line is operating at a low rate. They are a competitor for this contract though. They are a very fine competitor for this contract, I might add.

General MERRYMAN. The plan is to go fixed price, with economic price adjustments each year, and make it a multiyear contract, sir.

Commercial utility and cargo vehicle (CUCV)

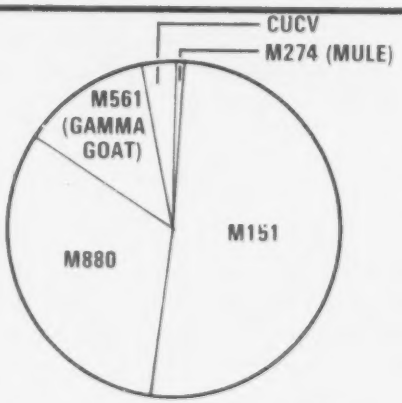
	Millions
Fiscal year 1983 weapons system procurement request	$183.4

A commercial utility vehicle to replace aging jeeps and commercial vehicles.
Complements HMMWV program.
Fiscal year 1983—2d year of a 4-year multiyear contract.
Total buy—49,569.
3,236 procured through fiscal year 1982 FDP.

This is a slide that depicts potential CUCV's, commercial utility cargo vehicles, and this is the program that complements the one I just described to you. It will also come in three body styles: Command/control functions, personnel cargo transport and ambulance. It will also be placed in combat service units. I said three, and I am sorry; it is actually four body styles. There is the ambulance and cargo shelter.

These vehicles will be found toward the rear and not up forward in the tactical zone.

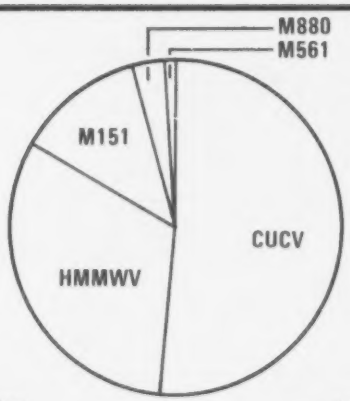
HMMWV/CUCV ASSETS FY 82



TOTAL FLEET	99710
M151	51109
M880	32681
M274 (MULE)	752
M561 (GAMMA GOAT)	11932
CUCV	3236
HMMWV	0

What this slide shows you is vehicle assets: the HMMWV, jeep, Commercial Utili'y Truck, M880, on the left and the Goat. You can also see the small number of the others in the upper center portion. By the end of fiscal year 1982 you will notice we still do not have any HMMWV's.

HMMWV/CUCV ASSETS FY 87



TOTAL FLEET	113916
M151	18290
M880	4379
M274 (MULE)	0
M561 (GAMMA GOAT)	910
CUCV	49569
HMMWV	40768

That chart shows you where we will be in 1987. HMMWV has now replaced the vehicles that it was supposed to replace, and you see a small number of remaining jeeps and a small number of GAMA GOA 75's.

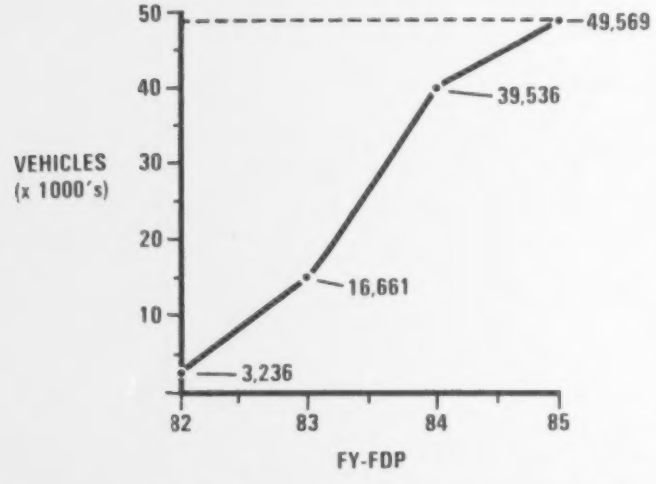
HMMWV FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Competitive production award for 1,180 vehicles.
Continued development of integrated logistics support package.

This shows you what the 1983 budget request would buy. Here again it would be a multiyear, fixed-price contract for HMMWV. This is what we would buy in 1983 in that program and it also would be multiyear, fixed price.

This shows you the HMMWV procurement plan over the years.

CUCV PROCUREMENT OBJECTIVE



This shows you the CUCV procurement plan over the years.

HMMWV - FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	10.9	3.0	2.7	—	——	16.6
WPN SYS PROC	——	——	38.6	173.7	982.5	1,194.8
QUANTITY BUY	——	——	1180	6193	33,395	40768

$(000,000)

This shows you the financial status chart for the HMMWV. Here again both programs will be competitive selection, multiyear, firm, fixed price and commercial components.

Senator GOLDWATER. Let me ask you a question there. These vehicles will not cost the same?

General MERRYMAN. I am indicating that they will not cost the same.

Senator GOLDWATER. Have you had a cost increase since the beginning of the program?

General MERRYMAN. To my knowledge, there has been no price increase. We have some estimated costs as to what we think they will cost, sir. I can give you some examples: Like in the HMMWV program, we are estimating the weapon-carrier at about $34,000, utility vehicles at about $27,000, and the ambulances at about $33,000; and the CUCV program, we are estimating the utility ve-

hicle at $12,000 and the cargo at $12,000 and the ambulance at $20,000.

Senator GOLDWATER. That is a lot of money.

General MERRYMAN. If you look at the fleet over all and what it is replacing, the Army found it cost effective in the study.

CUCV - FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ WPN SYS PROC		39.8	183.4	305.3	134.7	663.2
QUANTITY BUY		3236	13425	22875	10033	49569

$(000,000)

You have to remember that, for example, although the two programs are replacing the jeep, this vehicle here that replaces the jeep only costs about $12,000; that is our estimate; and the current jeep cost is $15,979, so what I am saying is that this vehicle that hauls considerably more than the quarter-ton, the old jeep, is considerably cheaper. The other vehicle is more.

Senator GOLDWATER. That is still a lot of money.

General MERRYMAN. What we are planning to do, sir, we don't know exactly the percentage of the general fleet that each one of these will replace, but the way it is looking is that the HMMWV would replace no more than 60 percent at this time. That percentage, of course, is not firm, but it means that at this time about 40 percent of the jeep fleet would be replaced with something that is considerably cheaper, and has a 5¼ ton capability versus a ¼ ton.

Senator GOLDWATER. What are you paying for a jeep now?

General MERRYMAN. $15,979; that is fiscal year 1983 dollars.

Senator GOLDWATER. OK.

SINCGARS

	Millions
Fiscal year 1983 R.D.T. & E. request	$17.9
Fiscal year 1983 weapons system procurement request	19.8

A lightweight anti-jam, secure voice radio that will meet the Army's tactical communications requirements for the post 1980's.
Fiscal year 1983: concurrent testing with 1st/yr production.
Total buy—244,000.

General MERRYMAN. The next program I would like to discuss is our SINCGARS. The Army needs this new radio because we need something that can operate on the battlefield that can handle electronic jamming. We also need a capability to transmit both voice and data. This particular radio will give us that capability. Until recently we were looking into three possibilities. We had one that we call a fast-hop radio and we were looking at two other contractors who were developing slow-hop radios. Are you familiar with what I am talking about when I say, slow hop and fast hop?

Just recently the Army, [deleted], determined that we did not have to go fast hop, but that slow hop would be good enough. What this means is that it will save a lot of money and will allow us to accelerate the program and get this radio in the field sooner.

So, the current plan is that we will complete the two slow hop competitors and there will be a September–January DT OE in 1982 and we will have a program review in January 1983 to select one of the contractors. Our plan would be to go contract award around March 1983, with maturity testing throughout the rest of that year, with an IOC now of July 1985.

That is accelerated at least a year as a result of the decision to go with two slow-hoppers rather than trying to look at all three.

Senator GOLDWATER. You say antijam, and you have to scramble to achieve that?

General MERRYMAN. You have all of these frequencies and if the enemy is out there and, let us assume all of my fingers are channels and he starts to jam. The radio has the ability or capability to jump all around and pick a channel that is free. It will do that with a radio that it is talking to on the other end.

Senator GOLDWATER. Who is your main source on this?

General MERRYMAN. We have two, sir, ITT and Cincinnati Electronics.

Senator GOLDWATER. What was the second one?

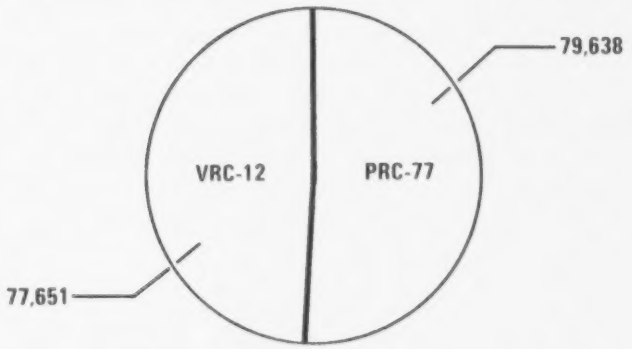
General MERRYMAN. Cincinnati Electronics. General Skibbie may know more about them.

General SKIBBIE. You might have heard it referred to as CECO—that is not the Japanese SEIKO; this is Cincinnati Electronics Co.

Senator GOLDWATER. Now I know what you are talking about.

General MERRYMAN. Our plan would be to go on a 5-year, multiyear, if we can award it in March 1983, with a follow-on second source in fiscal year 1986, which would also be multiyear.

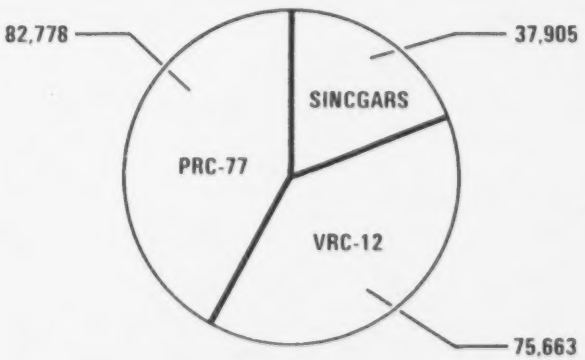
FM TACTICAL RADIO ASSETS - END FY 82 FDP



TOTAL ASSETS: 157,289

This shows you where we are at at the end of fiscal year 1982, the end of the funded period, with the radios we have in the Army. The PRC-77 is the one we use for manpack, and that is also found in some vehicles.

FM TACTICAL RADIO ASSETS - END FY 87 FDP



TOTAL ASSETS: 196,346

This shows you where we would be at the end of the fiscal year 1987 funded delivery period.

SINCGARS FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Development of components.
Maturation testing.
Tech data package.
Procurement of 450 radios.

This chart shows what we would buy with 1983 dollars.

Senator GOLDWATER. These are all transceivers, I hope?

General MERRYMAN. Yes.

Senator GOLDWATER. Have you looked at that new Collins-Rockwell 380?

General MERRYMAN. STAMAM?

Senator GOLDWATER. It is sideband, single sideband.

General MERRYMAN. I am not sure, sir. This would be an FM.

General SKIBBIE. Collins was the fast-hop competitor here, and then when we determined [deleted] that we could do without the fast hop, we terminated the fast-hop competitor.

Senator GOLDWATER. What power is the transmitter using?

General MERRYMAN. I don't know the power sir; it has a range of 4 to 35 kilometers.

Senator GOLDWATER. That is 4 to 35?

General MERRYMAN. Yes.

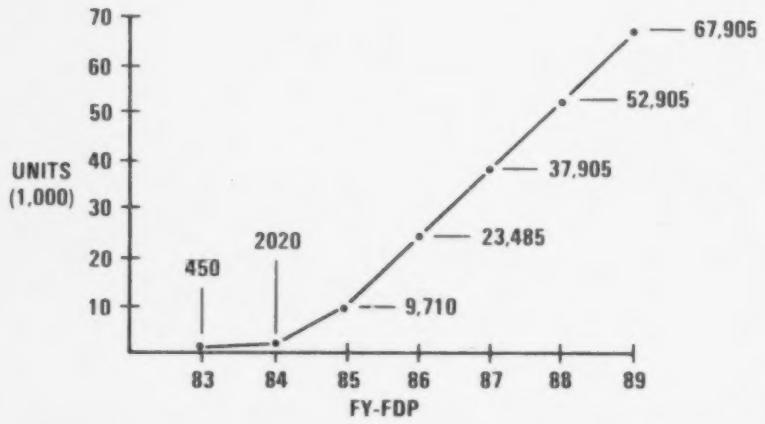
Senator GOLDWATER. You don't go into that?

General MERRYMAN. These are all short range. This replaces those radios now in the field with the troops.

Senator GOLDWATER. You almost have to stick to those frequencies on the ground?

General MERRYMAN. This increases the number of chances that you currently have, but you are right, on the ground you have to stick to that.

SINCGARS PROCUREMENT PLAN



This shows how we would buy toward the procurement objective.

SINCGARS - FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	FY 85-87	TOTAL
$ RDT&E	66.4	13.6	17.9	16.8	17.5	132.1
$ WPN SYS PROC	–	–	19.8	20.3	393.4	433.5
QUANTITY BUY	–	–	450	1570	35885	37905

$(000,000)

And this shows the financial summary and lays out the dollars as we now currently have them planned, and I have already described the acquisition strategy.

Position Location Reporting System (PLRS)

	Millions
Fiscal year 1983 R.D.T. & E. request	$9.4
Fiscal year 1983 weapons system procurement request	32.4

Permits rapid and accurate location of weapon systems and maneuver elements.
Fiscal year 1983—1st year of procurement.
Total buy: 23 master stations; 5,024 user units.

The last system I have to describe, sir, is the Position Locating Reporting System, PLRS, and it complements what I just talked about. If you can't talk to the guys who work for you, you are not going to win many wars, and also if you don't know where they are, you are not going to win many wars. Therefore, we need this system so we will know where our people are, so they will know where we are, where our aircraft are, and also to pass data between one position and another.

This is a joint Army/Marine Corps program. We have an ASARC scheduled for June and we have a cost estimate now being made. In a given Army division, and you would have two master stages working with this system, and 450 user units. What you see there on the slide, so you have 450 people out there with "user units." Some are at the platoon level. Therefore, we know the location of 450 elements of our organization. The two master units process that data to provide this information.

Senator GOLDWATER. I saw this demonstrated at the Yuma Test Center. That has been 2 or 3 years ago. I think at that time the pack weighed about 25 or 28 pounds, the backpack and it looks to me as if you have that lighter.

General MERRYMAN. What you are seeing in his hands there is the input device. I think the manpack is still—when you add the battery—that is what gets you up over 20 pounds—and I think the manpack is about 19 pounds, as I recall, and the battery is another 4 to 5 pounds.

Senator GOLDWATER. They were working on it. I was very impressed with that.

General MERRYMAN. It is sort of a dream world. When I started 30 years ago I wouldn't have believed that someday you could have

a gadget like this that would tell you what it tells you. If you are going to fight with a small Army, that small Army certainly needs to know where it is and that is the purpose of this system; that is what it is for.

Senator GOLDWATER. It will tell the user, as I recall, where he is within about 1 meter?

General MERRYMAN. It is about 15, sir, 15 meters. It is also three dimensional. I found out that the aviators can use it to tell where they are vertically, in addition to horizontally.

PLRS FISCAL YEAR 1983 BUDGET REQUEST

Provides for:
Procurement of 2 master stations; 165 user units; 385 installation kits.
Continued development of training aids and devices; portable test unit; automatic test equipment software.

This shows what the 1983 dollars in the budget request would buy.

Now, you may or may not be aware that we asked for dollars last year and the Congress did not give us dollars, and the Congress turned down our request at the end of the session because they questioned the reliability of user units. The requirement was 500 hours and we had not achieved the 500 hours. We have still not achieved the 500 hours, but we have achieved 288 hours, which is 57 percent of the requirement.

At this stage in the development the Army believes that is sufficient because, as you know, as you develop you get a learning curve and you won't be at 100 percent at this stage in the development, in our judgment.

We have two other systems that we have looked at that we think are comparable to what this one is, and we have looked at where they were in this stage in development and where are they now. The TPQ-36 radar, which is built by Hughes, to find enemy artillery and mortars was, at this stage in its development, 75 percent. Currently in production it is at 125 percent.

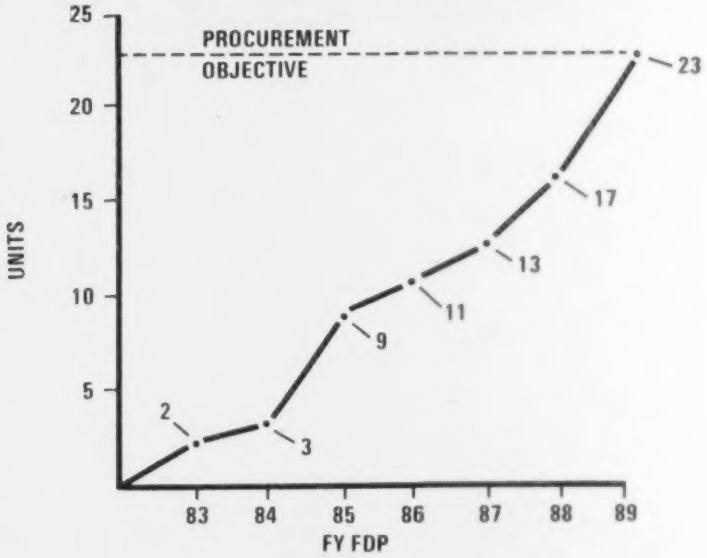
The second system is the AN TSQ-73, which at this stage was at 50 percent and now we have found in its production it is at 200 percent.

I am not trying to tell you that that is going to happen with PLRS because I don't have any idea. We have to deal with probabilities and that is what we have done. We are requesting the procurement dollars based on our analysis and belief that it is ready.

Senator GOLDWATER. Who is your manufacturer on that? I believe it was Magnavox.

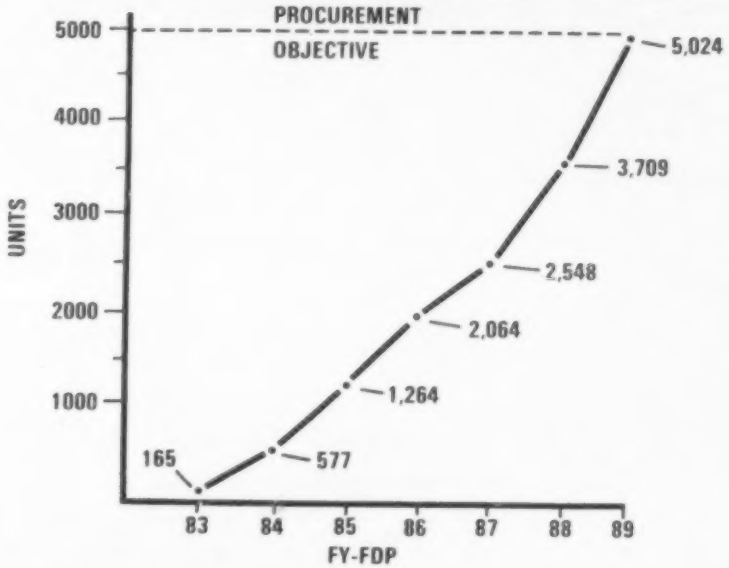
General MERRYMAN. It is Hughes. It is Hughes for both systems.

PLRS MASTER STATIONS PROCUREMENT OBJECTIVE



This shows how we provide for the procurement objectives. These numbers do not show the Marine buy, which would be above these numbers. There are the master stations, and the next chart shows you the user unit and how we would buy the procurement objective there.

PLRS USER UNITS PROCUREMENT OBJECTIVE



Senator GOLDWATER. Is that enough?

General MERRYMAN. In all honesty, we think it is now. We have a lot to learn. When we get this in the field we may find we need a lot more. On the other hand, we may find we can do it with less. Right now it is the best judgment.

PLRS - FINANCIAL SUMMARY

		FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
$ RDT&E		41.8	9.6	9.4	6.3	4.9	72.0
$ WPN SYS PROC		—	—	32.4	27.4	338.9	398.7
QTY	MASTER STA.	—	—	2	1	20	23
	USER UNITS	—	—	165	412	4447	5024
	INSTALLATION KIT	—	—	385	887	9458	10730

$(000,000)

This shows the financial status; the procurement would start in here and continue through 1989, and this chart shows you how many we would buy of the user units and master stations and kits.

TACTICAL AND SUPPORT VEHICLE—ARMY

Sir, with your approval, I would like to introduce at this time Major General Skibbie, who will give the final presentation of the

day, per the committee's request, on tactical and support vehicles, the other procurement, Army appropriation.

General SKIBBIE. Thank you very much for this chance to talk about the other procurement, Army, or OPA appropriation.

It is one of those less visible and less exciting appropriations but it is an extremely important appropriation.

The portion I have been asked to talk to you about is tactical and support vehicles, and that constitutes about 28 percent of the total appropriation.

As I mentioned, none of these things that we buy in other procurement, flies and there aren't any missiles there, and there aren't any tanks there, and there is no ammunition there, but without what we have here the tanks and the aircraft and the missiles don't work very well. So, for want of a better comparison, the nail, and the shoe, and sometimes the horse, for want of which a kingdom could be lost.

SINEWS OF SUPPORT

Ammunition.
Fuel.
Repair parts.
Casualties and evacuation.
Supply and SVC.
Engineer.
Transportation.

Now when we talk—General Merryman and our Deputy Chief of Staff for Operations—talk about sinews of support, they are really referring to logistics functions: ammunition, fuel, repair parts and the functions I have listed here. All of these are required for the combat force to counter the opponent and all require transportation, and that is my subject for today, the transportation and support vehicles portion of this other procurement, Army appropriation.

In the past, the other procurement, Army [OPA] appropriation has not been subject to authorization. One of the reasons, I think, that has caused it to simply be appropriated is that in this OPA appropriation there are 366 different kinds of equipment. Many people call them nits and grits, if you will.

Within the tactical support vehicle portion of this there are normally 29 different types of vehicles. In the 1983 request you will only find 19. There is a multiplicity of lines of equipment and yet I think I can summarize them for you very easily by rolling together some principal types of vehicles.

TACTICAL & SUPPORT VEHICLES
$ % OF OPA 1

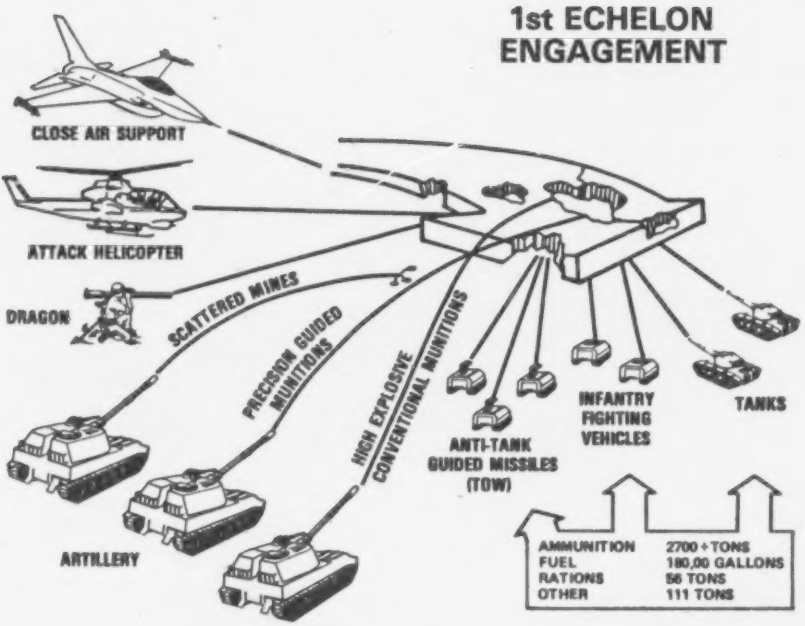
10 TON TRUCK	$374.1	30%
5 TON TRUCK	$392.7	31%
5/4 TON TRUCK	$222.0	18%
SUB TOTAL	$988.8	79%
REMAINDER OF OPA 1	$267.7	21%
OPA 1 TOTAL	$1256.5	

($ IN MILLIONS)

For instance, the 10-ton truck and the 5-ton truck and the 5¼-ton trucks which General Merryman has already talked about, comprise 79 percent of the tactical and support vehicle line. So, there are various models of the 10-ton but we are requesting approximately 30 percent of the OPA request for 10-ton trucks.

About 31 percent of our request is for various models of 5-ton trucks and about 18 percent is for the HMMWV and the CUCV which General Merryman just explained to you. That is a lot of money and that is a lot of resources that we are requesting, and that deserves attention as to why we need that much money.

Basically, here again we are playing catchup because our truck fleet, is both overage and short of required quantities. Now, I might mention, before I leave this chart, that the remainder of 21 percent, is devoted to a variety of articles ranging from trailers to nontactical vehicles that Senator Levin queried us about.



I believe that yesterday General Menetrey used a chart similar to this which described how the Army fights. He was talking about a first echelon engagement by an Army division consisting of tanks and fighting vehicles and antitank guided missiles and artillery and attack helicopters and close air support.

Probably what he didn't mention was the logistics required to support that force in combat for 1 day. As I have shown here, it takes 2,700 tons of ammunition; 180,000 gallons of fuel, 56 tons of rations and 111 tons of other repair parts and equipment.

Senator GOLDWATER. How many personnel?

General SKIBBIE. In a division there are 18,000 people.

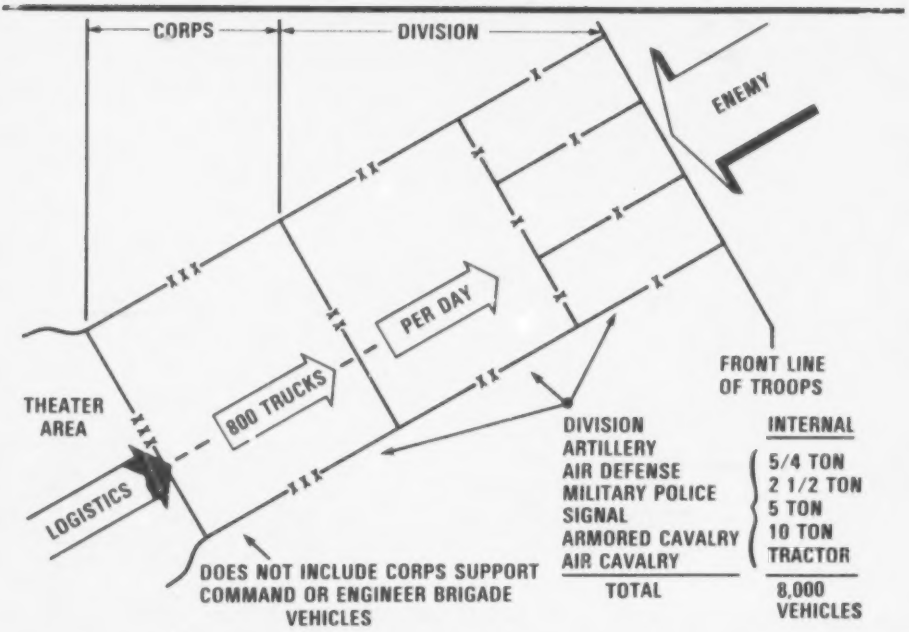
Senator GOLDWATER. I am talking about to operate this equipment.

General SKIBBIE. Well, you would have 18,000 people in the division and then they would be consuming these supplies during the normal day of combat.

Senator GOLDWATER. I thought you were saying it took that much in ammunition, but this is the supply for the entire division?

General SKIBBIE. This is for the entire division and to move that up, it takes between 800 and 1,000 trucks and trailers.

ONE DIVISION SLICE



I think this more graphically depicts it. To move those supplies, it takes between 800 to 1,000 trucks and trailers and that does not consider the 5,000-plus trucks and trailers that you already have in the division area. They are arrayed throughout the division area in the form of ammunition vehicles, ration vehicles, command-and-control vehicles, and vehicles with an antitank rocket on it, and I could go on.

These are the combat support functions that must be supported and gives you an idea of what these trucks and trailers are used for.

1982 OVERVIEW

	REQUIREMENT*	ASSETS	FLEET OVER AGE**
10 TON TRUCK	10,500	3,170	0
5 TON TRUCK	54,500	38,181	4,360
5/4 TON TRUCK	138,000	99,710	20,920

NOTES:

* EQUIP ACTIVE AND RESERVE, POMCUS, SOME WAR RESERVE

** 10 TON AGE CRITERIA – 20 YEARS
5 TON AGE CRITERIA – 20 YEARS
5/4 TON AGE CRITERIA – 7-12 YEARS

Now, if we just look at the three models of trucks that I said comprised 79 percent of our 1983 request, you can see our total requirement to equip the Active and Reserve Forces that comprise the 24-division force structure and to give those forces more reserves to take care of the first 30 days of combat. Therefore, our procurement quantity is not our entire acquisition objective; the term we use to describe the initial-issue quantity plus [deleted] of war reserve.

This then gives you where we are today. You can see that we have roughly 30 percent of our 10-ton assets, 70 percent of our 5-ton assets, and 72 percent of our light-load vehicles. Now, of those that we have, in the 5-ton truck area, 11 percent are overage. By overage I mean in excess of 20 years—many of the trucks are older than the drivers who are driving them. In the light-load area, 21 percent are overage and that age varies from 7 to 12 years, again depending upon the type of the light-load vehicles. That includes jeeps, gamma-goats, and that kind of vehicle.

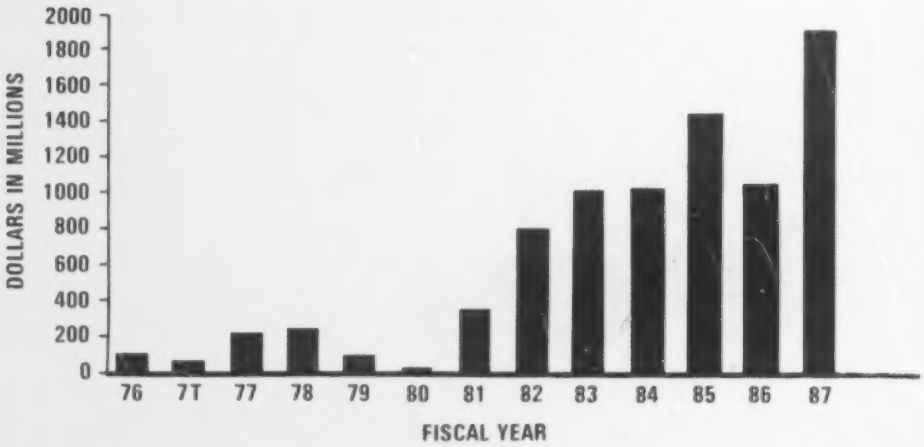
Senator GOLDWATER. That is a very sorry situation.

General SKIBBIE. It is, sir.

Senator GOLDWATER. Let us say we have M-Day and we are not ready to go to war.

General SKIBBIE. We are marginally ready. I know the four-star commanders talked before I did and I wish I had had a chance to talk to you before they did, and you could have questioned them and they would be emphatic. The Secretary of the Army mentioned it. Let me talk to you a little more about how we got into this situation.

TACTICAL VEHICLE PROCUREMENTS



This gives you an idea of the resources devoted to tactical vehicle lines over the period 1976 through 1986. The totals through 1982 inclusive have appropriated and the rest is requested. We estimate or we have calculated that to maintain our tactical vehicle fleet in a status quo condition—and by status quo we don't fill up any of the shortages and we simply retire vehicles at the end of the 20 years or whenever they are economically irreparable—it would take an investment of $680 million per year.

Now, you can see for this period of time we averaged about $100 million, so that was the period when the Army was short on resources, and we felt we needed to put a higher priority on other types of equipment; but we now need to play catchup in the tactical vehicle area.

To go back to the chart that you saw before, I just point out that the Army places a high priority on this; as you pointed out, it is a very serious situation. Appreciable resources are required; it will begin to redress the problems we have had and we will realize half of that is required to maintain status quo. Anything over $660 million will help us get well and start to fill up those shortages, and we have a 5-year plan to do just that.

I will close by paraphrasing something that former Secretary of Defense Wilson got in trouble for. I will try not to get in trouble with it, but I believe he said words to the effect that what was good for the country is also good for the automotive industry.

He mentioned a specific company and I won't. We feel that is appropriate with regard to the tactical vehicles. It is a particularly propitious time in history where the interests of the Army happen to coincide with the part of the industry of American that does need some assistance.

Senator GOLDWATER. Is this the first time you have presented these figures to the Congress?

General SKIBBIE. This appropriation has never been subject to authorization before. We, of course, have appeared before the Appropriation Committees and they are aware of it. I personally have never given this briefing; however, we have discussed with them the shortage of vehicles and I think they were instrumental in getting our truck program visible.

If you go back to the green bar chart here, you remember we did start kicking up our investment here in 1981 and 1982, and this was supported by particularly the House Appropriations Committee. I think that they worked with us to develop a good 5-ton program.

I would mention that all of the three programs that we are talking about, the HMMWV and the 5-ton programs, are all competitive. The 5-ton and 10-ton are firm, fixed-price contracts so that we can't have cost overruns, and they are all on 5-year multiyear contracts so we have those prices locked in with economic price adjustments. We are particularly proud of the business aspects of these programs which are also fulfilling a very serious need for the Army.

Senator GOLDWATER. That is hard to believe.

General SKIBBIE. I have the standard charts on the 5-ton and 10-ton, if you would like to see those.

Senator GOLDWATER. All right.

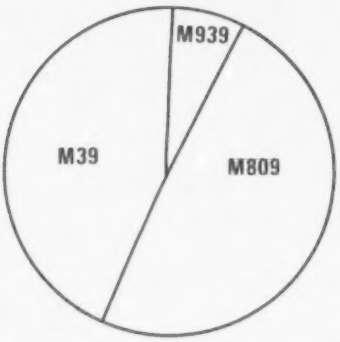
Product Improved 5-ton Truck

	Millions
Fiscal year 1983 weapons system procurement request	$392.7

General cargo transport (ammunition, fuel).
Supports fielding of new systems, tri-service program.
Diesel powered, 6 wheel drive, 7 body styles.
Fiscal year 1983—3d year of a 5 year multiyear contract.
4540 procured thru fiscal year 1982 FDP.

General SKIBBIE. We have 35 percent of our requirements there. This is an automatic transmission, and in fiscal year 1983 that will put us into a third year of a 5-year multiyear contract. That is a firm, fixed-price contract with AM General, American Motors.

5 TON ASSETS FY 82



TOTAL FLEET	38,181
M939 (PROD. IMP)	4,540
M809	16,787
M39	16,854

These are our current assets. In one sense they are the assets that we are using to fulfill 5-ton requirements, but realize that the M-39 is a 2.5 ton vehicle and so it is really not the ideal vehicle to be using for a 5-ton requirement.

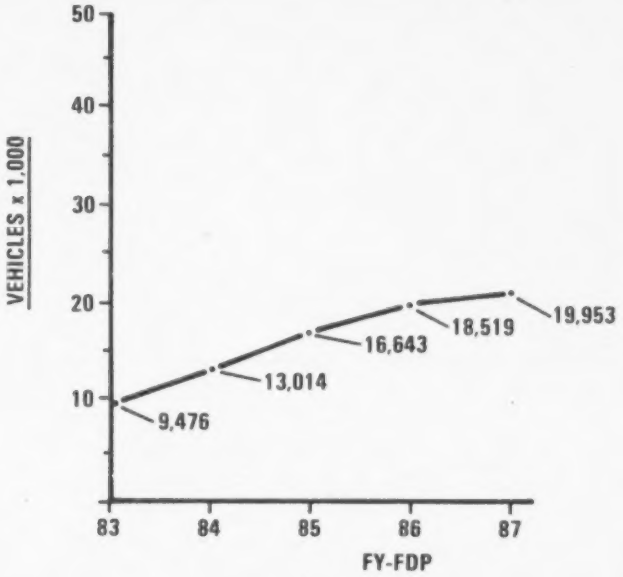
The M939 is the first version which is gas powered and the M-939 is the new version we just began buying in 1981. By 1987, over 40 percent of our assets will be the M-939 improved version.

5 TON ASSETS FY 87

TOTAL FLEET	50,980
M939	19,850
M809	16,163
M39	14,967

Of course, our 1983 request requests almost 5,000 vehicles and that is about 8 percent or one-quarter of that shortfall, if you will.

5 TON PROCUREMENT PLAN



Our plan for the 5-ton procurement, I believe, is a good, steady procurement profile and no jagged ups and downs and we don't intend to jack the industry around. Our plan is to smoothly progress toward our objective and by the end of 1987 we will be at a little over 93 percent of our objective.

5 TON - FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	———	——	——	——	———	——
WPN SYS PROC	76.2	295.1	392.7	275.0	633.4	1672.4
QUANTITY BUY	971	3569	4936	3538	6939	19953

$(000,000)

This financial summary summarizes what I just mentioned. I don't think it needs any amplification.

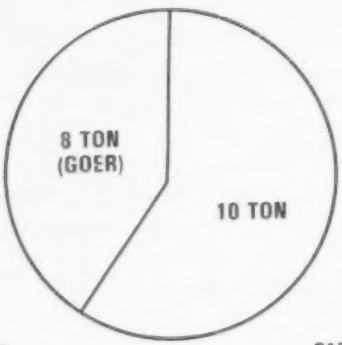
10-Ton Truck

	Millions
Fiscal year 1983 weapons system procurement request	$374.1

Ammunition and fuel transport.
Supports fielding of new systems.
Fiscal year 1983—3d year of a 5 year multiyear contract.
1,912 procured through fiscal year 1982 FDP.

This is the 10-ton vehicle. It is on a multiyear contract with, with Oshkosh Motors. If you will remember back to our requirements chart, we have about 30 percent of our requirements. This truck is used for hauling ammunition and fuel transport and it supports the fielding of new systems such as the multiple launch rocket system. Fiscal year 1983 is the third year of a 5-year multiyear contract. Again, it is fixed price and we have the price locked in with economic price escalation.

10 TON ASSETS FY 82

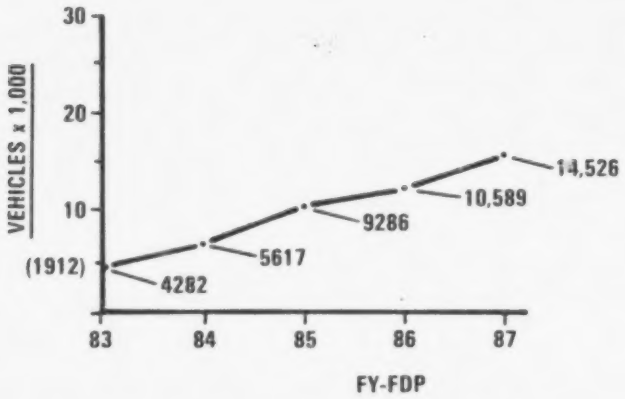


TOTAL FLEET	3170
10 TON	1905
8 TON GOER	1265

Our current assets, which as I said could respond to 30 percent of our requirement, are the 10- and the 5-ton. Of course, by 1987 we would have this many 10-tons and, of course, a small quantity of those (COER).

Now your 1983 budget buys you about 2,400 vehicles.

10 TON PROCUREMENT PLAN



Again, I think we have a good, smooth profile progressing to our objective out there in 1987.

10 TON - FINANCIAL SUMMARY

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	2.0	—	—	—	———	—
WPN SYS PROC	92.9	194.5	374.1	219.5	1633.6	2514.6
QUANTITY BUY	638	1274	2370	1335	8909	14,526

$(000,000)

Finally, our financial summary of the 10-ton vehicle. It constitutes 28 percent of the total other procurement Army appropriation. The total appropriation includes tactical and support vehicles, communications and electronics, construction equipment, and other than nontactical vehicles.

That concludes my presentation.

Senator GOLDWATER. Thank you very much. It is a very shocking thing. I just don't know what we would do if we were called into war in the next few days or the next few months. I don't know how we could ever fight a war without vehicles, and I don't think we could make them fast enough.

This is really shocking. I surely thank you for the presentation.

Now, I have a couple of points here:

Last year Congress terminated the SOTAS program after it doubled in cost in less than a year. The Army has budgeted close to $30 million this year for a follow-on of SOTAS, the battlefield

system. What is the Army's plan for the development of this system?

General MERRYMAN. The SOTAS program, if you recall, was to put a moving target indicator radar on a Blackhawk helicopter because the Army's biggest shortcoming in combat, has been its inability to know what is happening on the other side.

The SOTAS would let the division commanders see up to about [deleted] beyond the front while keeping our radar-equipped helicopters back about [deleted] kilometers. This protects the aircraft and enables our commanders to decide where to place our forces to counter their forces and employ supporting fires out to maximum range.

We need that capability and I don't think anybody questions that need.

What they questioned last year was the cost. What is the Army doing about it? The Army is looking at several alternatives as to how to meet that requirement, cheaper alternatives, than we gave to the Congress last year.

In addition to the Army's efforts, there is a joint group meeting under the auspices of Dr. Delauer's office in OSD, which is the Air Force and the Army together, and the reason we did that is that we can look at many of the capabilities that are out there, some in more classified programs than others, and some that maybe the Army was not aware of, and some that the Air Force was not aware of that we were doing.

They are making sure we look at all of the radars and all of the possibilities. Those two groups are currently trying to sort out what the Army's program should be this year. As soon as we determine what the Army's program is, we will let the committee know.

Senator GOLDWATER. What is projected to develop this capability?

General MERRYMAN. Sir, I don't have that with me, but I will be glad to get it for you.

Senator GOLDWATER. I wish you would. And what is the IOC of the system?

General MERRYMAN. I can't give you that either. The problem Senator Goldwater, is that I can't tell you what the system is right now because we are looking at various things, such as putting more than one kind of sensor in one aircraft to try to save money, and you do it in one platform; if you can do that, why not do it.

[The information follows:]

SOTAS-LIKE CAPABILITY

General MERRYMAN. We cannot provide an estimate yet. Too much depends upon the outcome of the Army and OSD reviews. We plan to have the basic system defined soon, and will provide preliminary cost estimates to Congress. Our goal is to reduce cost by adapting existing production sensors, and by using existing airframes and force structure. We are also examining the possibility of putting multiple sensors (e.g., COMINT or ELINT and radar) on a single platform.

The answer to the question might be that it would cost you too much, but that is the kind of thing we are looking at.

Senator GOLDWATER. Now, one more thing, on night vision devices, I am told the repair records and battery replacement records indicate that we are not routinely using our night vision devices,

particularly those intended for infantry. We have been assured that the Army trains regularly and prepares to fight at night. Now, are we in fact conducting meaningful training at night using night vision devices?

Dr. SCULLEY. It has been my experience in visits to the field that in fact we are. I have not been present at an exercise during darkness with the night vision devices, where they were not being used. I have had the privilege of using the second generation devices on the ground. I had the privilege of flying in a Cobra with the third generation goggles, and it is my opinion that they are being used.

Because of the expense, close to $35,000 a copy, I think the Army is in fact being very prudent in protection of these expensive devices in their training.

Senator GOLDWATER. In your opinion, are we prepared and properly equipped and trained to fight at night?

Dr. SCULLEY. In my opinion, we are. There have been great efforts in training to fight at night, and we are moving, I think rapidly to equip the force.

Senator GOLDWATER. This is one more point: During our session yesterday, the cost of an alternate helicopter to the AH-64 was discussed and as I recall the flyaway cost for the Cobra and a new AH-64 was stated to be about the same. We have been told that Bell Helicopter had proposed an enhanced Cobra for $4 million flyaway cost. The answers we received from the record from our AH-64 hearings indicated a flyaway cost for a Cobra as $7 million.

Could you explain the reason for this conflicting information that we are receiving?

General MERRYMAN. I think that I can. The answer I gave you yesterday, when I said the costs were the same, I told you that a couple of years ago, or actually about 3 years ago, we ran an analysis with our experts in St. Louis to determine what it would cost to develop a Cobra with similar capabilities to the AAH. They did that at that time and showed it costs about the same, and you could get the Cobra later. We have recently had them do the same thing again and the results were the same.

Now, the second figure that you quoted, I saw $4 million about Bell submitting a proposal, and that is about right. I saw that for the first time last night. That was a letter from their local representative to a gentleman in the Department of Defense, saying "we can do it for about $4 million" and in the last paragraph it said if you want the specifics, let us know.

That is a company that, in all honesty, is saying "We can do it for $4 million." When someone looks at what it is that the numbers will come out, it is closer to what our people in St. Louis came up with, because we went through the same thing 3 years ago when everybody was claiming they could do it then.

The third part of your question, sir, the $7 million, I am not familar with that. I would have to see what the $7 million related to.

I know it is confusing; it is confusing to me. You have to nail down what the number relates to; if it is 1983 dollars or whatever. I would be glad to get where that number came from and how it was specified and get you an honest answer.

Senator GOLDWATER. I wish you would do that.

[The information follows:]

General MERRYMAN. The figure of $7.0 million indicated in yesterdays testimony is for a twin engine Cobra with TADS/PNVS and equipped for Hellfire missiles expressed in fiscal year 1982 constant year dollars.

The figure of $4.0 million is Bell Helicopter's estimate for a Cobra with Mast Mounted Sight (MMS) similar to the Army Helicopter Improvement Program (AHIP) MMS and a single T701 engine. The Army estimates this configuration's unit flyaway cost to be $4.5 million again in constant fiscal year 1982 dollars. The Army estimate includes government furnished equipment (GFE) not included in the Bell estimate.

Also, if there would be a mechanical problem of putting this on the Cobra, as I recall the Cobra as now built doesn't have the width in front to handle a comparable construction you find on the AH-64.

General MERRYMAN. The Cobra, as you now know, it is at its peak. If you start putting something like that on the Cobra, you are talking about totally rebuilding it.

Senator GOLDWATER. I would like to know how extensive that would be.

General MERRYMAN. We would be glad to provide that also.

[The information follows:]

General MERRYMAN. To add the Target Acquisition Designation Sight/Pilot Night Vision Sensor (TADS/PNVS) and Hellfire capability to the AH-1S requires deletion of existing equipment and the addition of new. Among the major equipment deletions is the laser tracker, heads up display and M65 TOW missile system. These would be substituted with TADS/PNVS, Hellfire launchers, and the Integrated Helmet and Display Sight System (IHADSS). Additional required modifications are multiplexing the electrical system to provide the TADS/PNVS interface, increasing generator capacity, upgrading most avionics with newer/lighter equipment and adding a new mechanical environment control unit. These changes result in a 100-pound increase in empty weight which impacts on fuel and ordance capacity.

Structurally, the nose of the Cobra must be strengthened and extended to accept the TADS/PNVS.

Senator GOLDWATER. Is that all you gentlmen have?

General MERRYMAN. Yes, sir.

Senator GOLDWATER. Well, I want to thank you on behalf of the subcommittee. It was a very interesting presentation and I have enjoyed it.

I might say that I started my military life as a paddlefoot. I was a second lieutenant and then got smart and went into the Air Force. It got too dangerous down there.

[Questions submitted for the hearing record follow:]

QUESTIONS SUBMITTED BY SENATOR BARRY GOLDWATER

TACTICAL AND SUPPORT VEHICLE FUNDING

Senator GOLDWATER. Your request for Tactical and Support Vehicles totals $1.2 billion. The request for the Bradley Fighting Vehicle is just over $1 billion. In the event that there is a shortfall in available funds for vehicles, which program would you reduce?

General MALONEY. The Army has develped a budget that reflects the best possible balance of all requirements. Therefore, if the budget is reduced and the Army is given a choice about the programs that will absorb the reduction, the range of choices would not be limited to the Bradley Fighting Vehicle and Tactical and Support Vehicle budget lines. All programs would be reconsidered.

Senator GOLDWATER. The Army has requested $49.7 million for the Joint Service Rotary Wing Aircraft Development program.

Would you explain the purpose of this program?

What missions would such an aircraft perform?

What technologies are considered to be candidates for this program?

What level of funding is expected from the other services?

ANSWER. The purpose of the Joint Service Rotary Wing Aircraft Development program includes:

a. Development of a common advanced technology vertical lift aircraft capable of meeting multimission service requirements, while achieving a significant increase in performance over current aircraft.

b. Reduction of Department of Defense costs through execution of a joint development program for a common aircraft.

c. Achievement of the earliest practical initial operational capability.

The JVX performance missions include but are not limited to Army airborne intelligence gathering and electronic warfare, Marine Corps vertical assault and medical evacuation, Navy and Air Force search and rescue and Air Force special operations.

The technology configurations considered to be candidates for JVX include a pure helicopter, a compound helicopter such as the Advancing Blade Concept (ABC), the Tilt Rotor Concept, and the Tilt Duct Fan Concept.

At present the developmental funding shares for each service or the precise financial management has not yet been determined and is being addressed by each service and a joint services working group.

Senator GOLDWATER. After attracting considerable Congressional attention for cost growth in the UH-60 Blackhawk program, Sikorsky took dramatic management steps and now appears to have stabilized the steadily rising cost of that helicopter.

Would you report on the success of those joint Army and manufacturer's initiative?

General MERRYMAN. The joint Army-manufacturers management goals contained in the 5th year (fiscal year 1981) airframe contracts are:

a. Reprogram the shop loading system to avoid shop loading a work order in excess of the shop/machine capacity.

b. Schedule machine shop loading at or near capacity as opposed to backlog.

c. Change the major assembly and final assembly work order systems to identify "traveled" work—work accomplished out-of-station.

d. Effect a reduction in the manufacturing overtime rate.

e. Effect a reduction in the manufacturing absenteeism rate.

f. Establish and install a system to measure the utilization of key machining equipment.

g. Effect a reduction in the parts shortages.

h. Effect tool improvements. The progress of the joint Army-manufacturers management goals in the 5th year (fiscal year 1981) airframe contract can be summarized as follows:

The Army's Should Cost Review Team's October 1981 visit to the airframe manufacturer and a December 1981 UH-60A Black Hawk Program Progress Review disclosed that the airframe manufacturer:

a. Had off-loaded the machine shop and other department work down to a level within their capacities. This action resulted in a reduction in the out-of-station work on the major and final assembly production lines.

b. Had intensively tracked and controlled out-of-station manufacturing work. This action resulted in an improved production flow of UH-60A Black Hawk aircraft and has enhanced the smooth delivery of aircraft during the entire month as opposed to past practice of delivering all aircraft near the end of the month.

c. Had initiated a new procedure to quantify travel work on a weekly basis by aircraft number and manufacturing unit for major and final assembly. This procedure lends itself to computing weekly performance by aircraft and to developing effective work around plans.

d. Is progressing toward its assigned manufacturing overtime rate goal to reduce its manufacturing overtime rate from 18 percent in 1980 to 12 percent during 1981 and 6 percent by 1982. The manufacturing overtime rate through January 1982 was reduced to approximately 8 percent.

e. Is progressing toward its assigned absenteeism rate goal of 9 percent during 1981. To accomplish this goal, the airframe manufacturer developed and implemented new absenteeism control procedures. The absenteeism (absenteeism and vacation) rate declined from about 10.5 percent in January 1981 to 9 percent by January 1982.

f. Had established and installed a system that measured the utilization of key machining equipment. That system appeared to have been accomplishing the purpose for which it was designed.

g. Had significantly improved parts availability.

h. Had implemented a reasonably aggressive tool improvement program. For example, since September 1980, it had installed and put into operation twelve new machine tools and three replacement machines, at a cost of about $2.6 million.

Senator GOLDWATER. What confidence does the Army have that—given the track record of cost growth in the UH-60—the program is sufficiently stable to justify authorizing a multi-year contract?

General MERRYMAN. The Army has every confidence that the UH-60 program has stabilized and is an ideal candidate for a multiyear procurement starting in fiscal year 1982. This assessment is based upon the complete satisfaction of all multiyear selection criteria and the willingness of Sikorsky to sign up for a firm fixed priced multiyear contract.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

Senator THURMOND. Would you explain the history of cost overrun of the VIPER that caused it to change from less than $100.00 to almost $1,000 per unit cost?

General MERRYMAN. Viper costs are tracked as follows: Fiscal year 1976: Development estimate (76 $)--unit cost $78. Fiscal year 1981: Current estimate (81 $)—$787 (based on total quantity of .889M, fiscal year 1981-87).

Unit Cost Changes: (Fiscal year 1981) dollars—quantity, $66; economic, $184; engineering, $149; estimating, $267; other, $43 for a total of $709.

Quantity: Change from original estimate of 1.7M to .889M (all services) resulted in unit cost increase of $66.

Economic—$184: (1) Inflation ($109); (2) Incorporation of Cost Accounting Standard (CAS) 410 requiring G&A and fee on subcontractor costs ($6); (3) increases in material and labor ($69).

Engineering—$149: (1) Safety improvements ($49); (2) performance improvements ($32); (3) reliability improvements ($18); (4) launcher and firing mechanism design changes ($50).

Estimating—$267: (1) Refined labor and material estimates ($184); (2) other estimating error ($83).

Other—DTUPC did not include: $43; GFM ($38); cost reduction ($5).

VIPER

Senator THURMOND. What was the original requirement for armor penetration of the Viper?

General MERRYMAN. The Department of the Army Approved Required Operational Capability (ROC) for an Improved Light Antitank/Assault Weapon (ILAW), dated June 5, 1975, essential characteristics requires warhead penetration capability of "an average of [deleted] of rolled homogeneour armor plate."

Senator THURMOND. Does it meet those requirements today?

General MERRYMAN. The Viper is capable of penetrating [deleted] inches of rolled homogeneous armor plate.

Senator THURMOND. A recent GAO study recommended that the Viper not be permitted to go into production. What is the Army position on the GAO study?

General MERRYMAN. Attached is the Army classified response to the GAO report which was forwarded to OSD on September 9, 1981.

[Deleted.]

[Memorandum for Undersecretary of Defense for Research and Engineering]

DEPARTMENT OF THE ARMY,
OFFICE OF THE ASSISTANT SECRETARY,
Washington, D.C., September 9, 1981.

Subject: GAO Letter Report to the Secretary of Defense dated July 28, 1981, "Concerns About the Army's VIPER Light Antitank Weapon" C-MASAD-81-19 (OSD Case #1 5755).

The Army has reviewed the GAO report on the VIPER antitank weapon, and the following comments are provided for preparation of a reply from your office to GAO on behalf of the Secretary of Defense.

A General Officer In-Process Review (IPR) on 3 August 1982 determined that the VIPER was technically ready for production and that the VIPER satisfactorily met its requirements. At a decision briefing on 24 August 1981, the Army reaffirmed that the load-carrying capacity of the soldier demanded a lightweight (about 10 pounds) antiarmor weapon, that the VIPER best meets that need, and that VIPER production should begin as soon as possible.

The Army's generic lightweight antitank weapon is a battlefield proliferation weapon. Not only is it a "last ditch" weapon for Infantry forces, but also it is issued to supply, maintenance, and transportation troops throughout the battle zone. It must be light enough to issue to troops in addition to other equipment, it must be easy to use, and it must not require dedicated gunners or a crew. VIPER meets these requirements.

There is no antitank weapon of the weight class of VIPER that is as capable as this weapon. Also, the Army will pursue product improvements to the VIPER warhead [deleted].

[Deleted.] More detailed comments on the GAO report are at Inclosure 1.

AMORETTA M. HOEBER,
Deputy Assistant Secretary of the Army,
Research and Development.

Enclosure.

Test results show VIPER to be largely [deleted] it will face.

The VIPER is not largely ineffective against it will face. The VIPER's probability of single-shot kill requirements are against the [deleted]. The [deleted].

The VIPER is about as effective against the [deleted].

[Deleted] VIPER is one weapon in the family of antitank weapons. At longer ranges, tank guns and guided missiles engage enemy tanks. These larger, more accurate weapons are expected to have the capability to defeat [deleted]. The individually fired light antitank rocket trades off capability for less weight. In the close-range battle (300 meters), tactics and battlefield geometry provide numerous flank and rear shots. In fact, historical data and war-gaming models indicate that the majority of shots at tanks at a range of 300 meters will be flank and rear shots. Attachments 1 and 2 show [deleted].

[Deleted.]

The VIPER will be field in 1983. At that time, more than 50 percent of the [deleted]. As the [deleted] the VIPER will still be an effective weapon. As noted, at close range the majority of shots are flank and rear shots.

Even though tanks are the primary target for the VIPER, there are may other targets the VIPER can defeat including [deleted].

[Deleted.]

VIPER's cost has increased significantly.

The cost of VIPER has increased. In 1976 the design-to-unit production cost was estimated to be $78 (fiscal year 1976 dollars) for a production run of 1.7M rounds. Today, for the same quantity, the design-to-unit production cost is $660 (fiscal year 1981 dollars). Of that $582 increase, $247 is a result of design changes, additional material, revised subcontractor estimates, and a change in labor skill rates. The rest is attributed to inflation.

The "flyaway" or average unit procurement cost is dependent upon quantity. For instance, the cost is $793 (fiscal year 1981 dollars) for 1M rounds or $834 (fiscal year 1981 dollars) for the POM quantity of 860K rounds (Army, Marine Corps, and Navy).

The Army's cost reduction plans for VIPER include competitive procurement, value engineering, manufacturing process improvements, and increased quantity through foreign military sales. General Dynamnics has informally indicated that they are initiating cost reduction efforts with corporate funds.

Foreign Alternatives to VIPER.

The Army has surveyed "light" antitank weapons of the free world. None of these meets the U.S. Army requirements. Several tests and firing demonstrations have been conducted on foreign weapons.

Three systems mentioned in the GAO report (APILAS, UK LAW, PANZERFAUST III) are not available for testing. These weapons are being developed to penetrate [deleted]. However, their employment concept is different from that of the U.S. Army. These weapons are not to be "proliferation" weapons. They probably will be issued at no more than [deleted].

[Deleted.] Their employment and weight place them in our medium antitank weapon category. To our knowledge, [deleted].

[Deleted.]

The MBB company has indicated that they could produce a prototype of an improved ARMBRUST by 1983. However, that weapon would be no more capable than VIPER and would be heavier. It is estimated that the [deleted].

In any event, the weapon is not now available.

It is true that the reliability and consistency of the Army's data on these wapons is uncertain. The basis of this information is from contractors or foreign govern-

ments. For example, the French APILAS is said to weigh 18 pounds. This weapon was demonsrated at Aberdeen Proving Ground last July 14; when weighed, it was 24.5 pounds.

Even if these weapons were available now, it would be years before testing, contracting, production, and delivery could take place. Also, they do not meet the performance specifications of Viper. For instance, last July the APILAS noise level was measured at 185 dB for 26 milliseconds—far above the US Surgeon General's limit. Much time and effort were expended on VIPER to meet that requirement.

The test results on VIPER do not warrant an investigation of foreign systems to confirm their capabilities. Indeed, the [deleted].

[Deleted] and VIPER can be produced and fielded in 1983.

[Deleted.]

There are no outstanding technical problems on the Viper. All have been resolved.

There has never been an "accidental firing" of the Viper. The performance specification for electromagnetic radiation/electrostatic discharge (EMR/ESD) have been met. Government tests were conducted at Redstone Arsenal in July 1981.

There is no technical problem with the firing mechanism. Of the 400 VIPER rounds fired in OT II, there were 15 misfires. Of those 15, 7 fired when the gunner fully extended the launch tube and reactivated the firing mechanism. The remaining eight consisted of one broken wiring harness, one defective squib, and six with defective batteries. The last 156 rounds had a more reliable battery installed, and there were no misfires. The Viper operational reliability was demonstrated to be 94.6%. There is expected to be no problem in reaching 97 percent reliability once the weapon is in production.

The VIPER passed the 2-hour water immersion test by removing the interlock pin from the firing mechanism. However, the Army decided that the safety feature provided by the interlock pin was more important than meeting the water immersion requirement. When the unprotected round is submerged in water it does leak in 3 to 5 minutes. Until issued for use, the VIPER is packaged in a barrier bag. The VIPER in the barrier bag does pass the water immersion test, and VIPER has passed mud and splatter tests.

CARBORANE PROPELLANT

Senator THURMOND. How stable or reliable is the carborane propellant?

General MERRYMAN. Carborane is both stable and reliable. There have been no significant problems with the Viper's propellant which contains carborane, a burning rate additive.

PROPELLANT STORAGE

Senator THURMOND. Will the carborane provide the required ten-year storage life?

General MERRYMAN. At the present time the Army is confident that the Viper propellant will provide a 10-year storage life. A surveillance program is planned to begin once Viper production rounds are delivered. This program will evaluate the effects of storage upon the Viper system at regular intervals.

PROPELLANT REPLACEMENT

Senator THURMOND. If the carborane propellant must be replaced to achieve the required 10-year storage life, what impact will that have on cost?

General MERRYMAN. Again, at the present time the Army foresees no problem with a 10-year storage life for Viper propellant. Assuming that the Viper propellant had to be replaced for some reason, a study would have to be undertaken to determine the most economic method of replacement such as replacement of motors, replacement of entire rockets, or restriction for training use. Obviously, there would be costs associated with these type actions, but the exact amount is unknown at this time.

QUESTIONS SUBMITTED BY SENATOR JOHN W. WARNER

LIGHT ARMORED VEHICLE (LAV)

Senator WARNER. I understand four vehicles are currently being evaluated. What is the status of the program?

ANSWER. On September 11, 1981 four contracts for candidate test vehicles were awarded. Cadillac Gage of Warren, Michigan, received two contracts—one for their four-wheeled vehicle, the Commando V150, and one contract for their six-wheeled vehicle, the Commando V300. Alvis Limited of Coventry, England, was awarded a contract for their tracked vehicle, the Scorpion. The fourth contract was awarded to General Motors of Canada. The Canadian vehicle is an eight-wheeled vehicle designed by MOWAG of Switzerland. On 1 November 1981 each contractor delivered three test vehicles. The fourth test vehicle was delivered on 1 March 1982. Testing began on 1 November 1981 and has included automotive performance tests, automotive and weapons system safety certification, accuracy firings, and test mileage runs. On 18 March 1982 each of the vehicles was subjected to a static lift by the CH53E helicopter. Tests are on schedule and will be completed on 31 May 1982.

Senator WARNER. Are there any major differences at the present time between the Army and the Marine Corps on what type of vehicle is required, type of armament desired or whether a tracked or wheeled vehicle is needed?

ANSWER. There are no major differences between the two Services on type of vehicle and armament desired. In the baseline program both Services are seeking a light armored vehicle armed with a 25mm Bushmaster cannon. The fiscal year 1983 plans for both Services reflect the procurement of only that vehicle. The solicitation to industry and requirement documents of both Services indicate that either a wheeled or tracked vehicle may fulfill the requirement. The ongoing competitive tests contain wheeled and tracked candidates. Once a winning vehicle is selected, both Services foresee the potential for using that basic vehicle for other roles using other configurations, i.e., a squad carrier and a recovery vehicle. Plans are to reconfigure the basic vehicle, test those variations and procure them in the outyears.

Senator WARNER. What is the quantity of vehicles anticipated for procurement?

ANSWER. The Marine Corps plans to procure 60 vehicles with the Bushmaster in fiscal year 1982 with an additional procurement of 134 Bushmaster vehicles in fiscal year 1983. The Army's initial procurement is for 175 Bushmaster vehicles. Considering the potential procurement of other variants to the basic vehicle, the total program calls for the purchase of 3,059 vehicles during the fiscal year 1982 through fiscal year 1988 timeframe. There are 744 vehicles for the Marine Corps and 2,315 vehicles for the Army.

Senator WARNER. As originally planned this was an "off-the-shelf" buy. There are rumors the cost is escalating considerably. Please give a breakout of current total cost estimates.

ANSWER. There is no real basis for a cost escalation to this program at this time. Procurement analysts have provided a best estimate of the cost of such vehicles based on known costs of certain components. In the final analysis we must await the responses from industry to our Production Request for Proposal. That response is due April 1, 1982. The Army's "best estimate" of the procurement costs of the LAV program is attached.

U.S. ARMY'S LIGHT ARMORED VEHICLE PROGRAM

(PROCUREMENT $ MILLIONS)

ITEM	FY 1982 QTY/$	FY 1983 QTY/$	FY 1984 QTY/$	FY 1985 QTY/$	FY 1986 QTY/$	FY 1987 QTY/$	FY 1988 QTY/$	TOTAL QTY/$
LASC			173/$85.3	173/$82.9	299/$112.5	520/$204.3	297/$118.0	1462/$563.0
MPC-M		175/$111.3	200/$136.0	240/$158.8	65/$44.0	0	0	680/$448.1
LARV			51/$18.8	35/$12.3	44/$16.1	53/$20.2	0	183/$67.2
TOTAL ARMY		175/$111.3	424/$219.9	448/$232.8	408/$172.6	[illegible]/$24.5	297/$118.0	2315/$1078.3

DESIGN CHANGES

Senator WARNER. How many design changes have been specified?

ANSWER. There have been no design changes to the basic vehicles currently being tested. There have been two amendments to the basic solicitation. These amendments directed a total of 28 specification changes. In the case of the basic vehicle the specification changes more accurately described specific capabilities of components. With regard to other potential variants the specification changes will require design changes. For example, in the squad carrier the Army desires that a Mark 19 40mm grenade launcher be installed as the primary armament. In the case of the recovery vehicle an auxiliary power unit (APU) is required.

BUSHMASTER UNIT COST

Senator WARNER. What does the unit cost look like at the present time?

ANSWER. Army procurement analysts estimate that the price of the 25mm Bushmaster vehicle may cost $457,000 to $477,000. Other variants could cost as much as $610,000, for example, a variant with an Air Defense system installed. The final determination of costs must await industry's response to the Light Armored Vehicle Production Request for Proposal, government and industry negotiations and industry's best and final offer with regard to costs. Cost data is in constant fiscal year 1982 dollars.

MULTIPLE LAUNCH ROCKET SYSTEM

Senator WARNER. How is the Multiple Launch Rocket System (MLRS) coming regarding price and performance compared to what was required in the initial specifications?

General MERRYMAN. The Multiple Launch Rocket System has been highly successful in both areas. The program successfully completed its Defense Systems Acquisition Review Council III (DSARC III) milestone decision review in May 1980, meeting or exceeding all technical, integrated logistic support (ILS), cost, and schedule thresholds, and entered concurrent system maturation development and low rate production. The program continues to meet or exceed these thresholds except for a four-month schedule delay resulting from a strike at FMC Corporation, which produces and delivers the system's carrier vehicle to the Government. These vehicles are then provided as Government-furnished equipment to the MLRS prime contractor. Current system specifications are consistent with those originally established.

ROLAND

Senator WARNER. We know about the reductions in the Roland program last year. I am aware of the requirement of the Appropriations Committee for a report on how the Army intends to handle the Air Defense problem without Roland. What is the status of that report and when will it be submitted? Can you indicate what some of the findings will be?

General MERRYMAN. An overview of the Army Program Plan for air defense, which addressed this issue, was presented to Subcommittee on Procurement and Military Nuclear Systems, House Armed Services Committee on 18 March 1982. A formal transcript for the record has been submitted.

Replacement for Roland will be provided by the currently deployed Chaparral/Vulcan (c/v) battalions and improved Hawk. The Army's decision to retain improved Hawk was based in part upon our desire to bolster the air defense coverage for critical air bases and logistical complexes in USAREUR. The defense coverage will be increased and with a more capable system. [Deleted.]

[Deleted] will be protected with the C/V—improved Hawk force supported by Patriot.

An integrated family of Army air defense weapons, coupled with dedicated air-to-air interceptors, is required to counter the threat.

Low altitude and short range air defense weapons now in the field are the Stinger, Redeye and Chaparral missile systems, and the Vulcan 20mm gun system. These weapons are deployed to provide air defense of forward combat maneuver units and point defense for rear area assets. Improved Hawk provides the forward and rear areas with low and medium altitude all weather air defense. High altitude all weather air defense is provided by the Nike Hercules missile system.

The Chaparral missile system will be up-graded by product improvements which include a Forward Looking Infared (FLIR) sub-system, designed to improve its day/night capability. Improved Chaparral will remain in the Army's arsenal as the short range air defense (SHORAD) missile system. Product improvements also have been applied to improved Hawk to sustain system life.

Future low altitude weapons systems include Stinger, a completely new manportable air defense system (Manpads). Stinger is in production and began replacing the Redeye Manpads last year. The Divad Gun is being developed to replace the self-propelled Vulcan gun system in the Heavy Division. The Divad Gun System will provide effective all weather air defense in the forward battle area against fixed and rotary wing aircraft opposing our maneuver units operating close to the line of contact. A "Light Weight" Air Defense System is being considered for the Light Divisions to replace the Vulcan Gun. The Roland is also being acquired in limited quantities to provide a responsive all-weather air defense capability for the Rapid Deployment Force.

High and medium altitude all weather air defense will be provided in the future by the Patriot missile system. All Nike Hercules and some Improved Hawk will be phased out during Patriot's arrival in the inventory. Improved Hawk will protect USAF air bases and critical logistic depots in Europe Improved Hawk will also round out the air defense for the RDF.

Air defense of our Army in the field is vital to sustain its Army combat effectiveness. Air defense requires a mixture of weapon, guns and missiles, with diversified capabilities that collectively provide all weather, all altitude protection against hostile aircraft.

TURRETLESS TANK

Senator WARNER. Recently there was a report that the Army is developing a new turretless tank, a derivative of the M1. This new tank will have a crew of three men, a new automatic loader, and because of no turret, a much lower silhouette.

What is described sounds very much like the Multiple Protective Gun System (MPGS) which is currently being evaluated.

What are the differences in these two programs?

What size gun is envisioned for this new tank?

ANSWER. There are significant differences between the Mobile Protected Gun System (MPGS) program and the Tank Test Bed program. The MPGS program is a developmental program designed to provide the Army light divisions with a lightweight (less than 20 tons), highly mobile assault vehicle. The acquisition strategy will include development of a vehicle, weapon system and ammunition. The MPGS must be capable of strategic deployment in USAF C-141B aircraft in a ready-to-fight configuration. The system must also be capable of transport, in a ready-to-fight configuration in USAF C-130 tactical airlift aircraft. The mobility requirements dictate the MPGS will be a lightweight system. The lighweight MPGS system will not replace the main battle tank.

The objective of the Tank Test Bed program is to demonstrate and evaluate future combat vehicle technology in vehicle test bed hardware to determine feasibility and military potential. The Tank Test Beds are being developed to explore options for advanced vehicle designs which significantly increase tank survivability and operational characteristics through innovative integration of the current component and technology base. The test beds will be utilized to provide system evaluation of the following technologies:

a. Advanced optics such as improved panoramic sights and fiber optic links allowing the crew to be separated from the sight.

b. Sensing for surveillance and target acquisition by the use of CO^2 lasers, Far Looking Infrared (FLIR), improved thermal sights, television and milimeter wave.

c. Automatic loading in the 120mm tank gun as part of an externally-mounted weapon on a rotating platform as a means of reducing the armored volume of a future tank.

d. Reduced crew size. If the functions of loading can be accomplished by a automatic loader, this would allow a reduction in the crew from four to three, reducing peacetime O&S costs and enhancing our war fighting capability by availing additional manpower to accomplish other combat missions.

The chassis of the M1 will be the basis of the test beds and a goal of the program will be to develop options which preserve the M1 facilities and utilize M1 components to the maximum degree possible. The test beds are not prototype tanks but test vehicles that will provide data and information on which future designs in the 45 to 55 ton class vehicles may be developed.

VIPER

Senator WARNER. Last year the Congress directed that there be direct competition, or a fly-off between the Viper and its competitors. What is the status of that program and how is the Viper doing on cost and performance?

General MERRYMAN. On December 15, 1981, the Joint Conference upheld Senate language which directed the Army to conduct an evaluation of foreign and domestic light antitank weapons. The Army, with OSD(USDRE) participation, has established a three phase program to comply with congressional language and Army requirements. Phase I of the program is in progress; screening criteria are being established, with advertisement (in Commerce Business Daily) no later than May 15, 1982, at which time Phase II begins. The Army will be ready to test by August 1, 1982 (77 days following advertisement, within the 90-day requirement in the congressional language). Testing is subject to contractor delivery of systems for test, at no cost to the government, in order to comply with the Joint Conference Report to conduct the program within existing funds. Participating contractors will also be asked to provide a schedule and fixed price proposal for rounds to be purchased for Phase III, and proposals for quantity production, costs, and facilitization. These will be validated by OSD Cost Analysis Improvement Group and Product Engineering Services Office. All Phase II testing will be completed by July 31, 1983. Following test reports, a Joint IPR (Army/USMC will be held to determine which candidate systems meet requirements for combat effectiveness, cost, and production capability, and which, therefore, will be participating in Phase III, consisting of Operational and further Development Testing (DT/OTII), leading to an IPR for type classification and production decision.

Extensive government/contractor negotiations have resulted in a projected average recurring unit cost (fiscal year 1982–87) of $761 in fiscal year 1981 dollars of $959 in fiscal year 1983 dollars. This is predicated upon cost reduction efforts and fiscal year 1982–83 facilitization, and quantity stability (all Services).

Viper meets required performance criteria as revised. The revisions are:

	Requirement	Actual
Probability of single shot kill (SSKP), cardioid average:		
[Deleted]	[Deleted]	[Deleted]
Water submersion 3 ft of water	2 hrs	5 min

Meeting the water submersion requirement would have been at the expense of safety—removal of the interlock pin. The Army opted for safety. Viper does pass the 48-hour rain test.

JOINT SERVICES ADVANCED VERTICAL LIFT AIRCRAFT DEVELOPMENT PROGRAM

Senator WARNER. The Joint Services Advanced Vertical Lift Aircraft Development Program is a new program designed to develop a joint multi-mission common aircraft to replace several new helicopters planned by all four services. As the Executive Service for the program, do you feel this is the proper approach to be taking in the development of a new aircraft?

What type of aircraft do you envision evolving from the program?

Would you anticipate the tilt rotor concept to be a strong competitor?

What is the total number of aircraft anticipated for future procurement, by service, and for what missions?

With a concentrated effort, can an IOC of 1990 be reached?

ANSWER. Yes. We feel that it is possible to jointly develop an advance rotary wing aircraft. However, it may be necessary to make essential compromises in each of the services originally stated requirements. It is clear that this development program can provide performance and other capabilities well beyond anything in existence today. Additionally, none of the Services have the resources to undertake an effort like this by itself. If all the Services can continue the same level of cooperation that has existed to date, the Joint Services Advanced Vertical Lift Aircraft Development Program is possible.

This program will result in the fielding of an advance technology vertical lift multimission aircraft which will have speed, range and load carrying capabilities on the order required by each of the Services for those missions previously stated.

Yes. The tilt rotor concept along with the compound Advancing Blade Concept, the title duct fan concept and pure helicopter concept all remain strong competitors. An on-going Joint Services Technology Assessment Group will attempt to optimize a suitable configuration fulfilling existing Service requirements.

To date and subject to change as the Services define their requirements, the following aircraft are anticipated by Services for future procurement by mission:

U.S. Marine Corps: Mission—vertical lift assault and medical evacuation. Initial Planned Aircraft—552.

U.S. Navy: Mission—Combat Search and Rescue. Initial Planned Aircraft—50.

U.S. Air Force: Mission—Combat Search and Rescue and special operations. Initial Planned Aircraft—200.

U.S. Army: Mission—Corps airborne intelligence gathering and electronic warfare. Initial Planned Aircraft—230.

Technically, an Initial Operational Capability (IOC) of 1990 may be achieveable; but, that would assume that the development would be free from the normal programmatic restrictions and impedances which accompany any project of this sort. The program plan has not been solidified at this point so it would be too optimistic to categorically state when the IOC can be achieved. I think it would be more prudent to expect an IOC in 1991 or more realistically, 1992.

Senator WARNER. Joint Services Advanced Vertical Lift Aircraft—2.

With this joint concept can we expect a shortened development cycle?

Can significant cost reduction be expected with this style of joint development?

Is each service an active and agreeable participant in the program?

What are the funding requirements to provide for a program to meet the IOC mentioned above?

ANSWER. We do not expect the development cycle to be shortened by virtue of this being a joint program alone. However, we do expect that this program can be accomplished more expeditiously through application of the administration's new acquisition initiatives.

Because of the anticipated sharing of the total development costs, it will be much less costly for each of the Services individually. In addition, the overall costs to the Government as a whole will be much less than if each Service attempted to meet its own mission requirements in separate ways.

It is difficult to judge specifically at this time the totality of support in the other Services, especially since we have not yet determined the aircrafts specific configuration, performance characteristics or cost. We believe that all the Services do agree with the overall program goals and objectives, but there may be variances in the sense of urgency.

At this point in time, we are not sure. There have been a number of studies in the past which have reflected widely varying cost estimates. We have just completed a draft Joint Services Operational Requirements document and that is being used by a Joint Services Technical Assessment Group to determine where feasibility and cost versus performance tradeoffs must be made. We will be going through the process of making those tradeoffs in the late spring to early summer. We should have a realistically accurate fix on costs by mid-summer.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN

REDUCING "COST PLUS" CONTRACTS

Senator LEVIN. Yesterday, as part of his testimony about efforts to reduce costs, one of the Army witnessess, General Merryman I believe, stated the Army was implementing a policy to reduce the number of "cost-plus" contracts it awarded and substitute for them "fixed-price" type contracts.

1. What was the Army's policy as to the frequency and appropriateness of use of cost-plus contracts in the past?

2. Has it been demonstrated through historical analyses or other studies the Army has done that cost plus contracts lead to greater costs and less pressure on contractors to hold-down expenses to the Government? Could you provide such evidence to the Committee.

3. What other reasons led to the Army's policy change?

4. What restrictions have you imposed to minimize the use of cost plus contracts?

5. How will you implement such policy changes to ensure that they in fact take place?

6. What type programs are least useful to undertake under cost-plus contracts; under fixed price contracts?

General MERRYMAN. Senator, I think we have a misunderstanding in regards to what I said or intended in regards to the Army's policy on what contract type should be used. I'd like to offer a clarification which will answer some of the questions you have asked and obviate the need for answers to some of the others. The Army's policy on the type of contract to be used has not changed. Each requirement must be assessed on its own merits and the appropriate contract type selected that

apportions the associated risks between the contractor and the Army in an equitable manner. Generally speaking the fixed price, or some form of fixed price, type contract is preferred and will continue to be used, when appropriate. However, on some requirements, such as research and development projects, the technical uncertainties may pose cost risks that are not susceptible to a fixed price type contract. In such cases, some form of a cost type contract may be justified to reduce an unreasonable amount of risk of performance to the contractor. In this regard the Army continues to follow the DoD policy promulgated by the Defense Acquisition Regulation and the Deputy Secretary of Defense's Acquisition Improvement Program, specifically Initiative #8 on the use of Appropriate Contract Type. We have no historical analyses or evidence that cost type contracts lead to greater costs and less pressure on contractors to hold-down costs and we have not imposed any new rules or restrictions on use of cost type contracts. As to the type of programs that are least useful to undertake under cost or fixed price type contracts, I do not think you can determine contract type by program, at least if you mean program in the sense of specific weapons systems. A more appropriate indicator is what phase of its life cycle the program is in at the time. Generally, as programs move through the life cycle the risk in performing the associated contracts decreases, therefore the contract type should move from some form of cost type category to some form of a fixed price type.

ADMINISTRATIVE USE VEHICLES

Senator LEVIN. In terms of dollars and numbers of vehicles, how much is in the fiscal year 1983 budget for the pruchase of nontactical administrative use vehicles? How much is in the fiscal year 1983-87 program? Please give annual data.

Is the Army the purchasing agent for the other services? If so, provide the annual fiscal year 1983-87 program for AUV purchase for them also.

NONTACTICAL VEHICAL PROGRAM

General MERRYMAN. The Army's Non-Tactical Vehicle (NTV) procurement program for fiscal year 1983 through fiscal year 1987 is as follows:

	Fiscal year		
	1983	1984	1985-87 to completion
Quantity	6,839	14,294	30,163
Cost (millions)	$78.1	$175.0	$434.7

The Army is the purchasing agent for other services requiring NTV when the Gross Vehicle Weight (GVW) is 10,000 pounds or more. NTV's weighing less than 10,000 pounds are purchased for all services by the General Services Administration (GSA).

The Army's procurement programs for other services for fiscal year 1983 through fiscal year 1987 are as follows:

Service	Fiscal year		
	1983	1984	1985-87 to completion
USAF:			
Quantity	1,838	2,389	5,981
Cost (millions)	$57.1	$74.9	$217.6
Navy:			
Quantity	749	1,050	4,640
Cost (millions)	$11.9	$15.3	$69.9
USMC:			
Quantity	369	478	2,736
Cost (millions)	$8.8	$10.5	$39.1

Senator LEVIN. Do you think that American vehicle manufacturers should be permitted to compete for these contracts to provide these vehicles?

General MERRYMAN. American manufacturers currently are able to compete for our non-tactical vehicle requirements procured by the U.S. Army Tank Automotive Command and the General Services Administration. These acquisitions constitute the majority of our non-tactical vehicle procurements and American manufacturers will be permitted to continue to compete for these requirements. The DOD non-tactical vehicle program in Germany is based on interoperability and standardization with vehicles in the German Army. In order to do this, we have purchased German vehicles under a basic ordering agreement. To do otherwise eliminates the possibility of maintaining the desired standardization and interoperability with the German Army and increases the logistics problems for our forces in Germany.

Senator LEVIN. How much of the 5-year AUV program is to be purchased overseas from foreign manufacturers?

General MERRYMAN. Our past planning has projected approximately $10-14 million per year for fiscal year 1983 through fiscal year 1987 to be spent offshore to cover non-tactical vehicle requirements in Germany, Italy, and the United Kingdom.

Senator LEVIN. If Congress were to add to law a provision permitting present agreements to buy AUVs overseas, but to prohibit such agreement in the future, why should the Army object?

General MERRYMAN. The Army desires to continue those programs currently underway in Germany as well as those planned for the United Kingdom and Italy. As Dr. Sculley has said, we do not plan to expand these programs beyond that which is currently approved. However, we would prefer not to see such restrictive language imposed on future actions since it substantially reduces our flexibility to respond to changing requirements. The Army must continue to have the ability to respond to special requirements.

HUM-VEE

Senator LEVIN. Why would it make poor economic and military sense to reduce the purchase of HUM-VEEs and substitute jeeps?

General MERRYMAN. The Tactical Wheeled Vehicle Fleet Requirements Study, submitted to Congress in October 1980, evaluated nine (9) alternative fleet compositions. It was determined that a mix of ¾, 2½, 5 and 10 ton trucks best met the needs of the Army. The High Mobility Multipurpose Wheeled Vehicle (HMMWV) and the Commercial Utility and Cargo Vehicle (CUCV) were selected as the Army's strategy to support implementation of the ¾ ton fleet requirement. In selecting this alternative (and eliminating the M151 ¼ ton) both numbers and types of vehicles were reduced and manpower and dollar resources were saved. Most M151's currently require a trailer to meet operational requirements degrading its off-road performance. Introduction of the HMMWV and CUCV eliminate these ¼ ton trailers. However, the M151 even without a trailer does not possess the required mobility, agility, and survivability required on the modern battlefield. Additionally, the requirement to minimize the kinds of fuel that must be transported to the battlefield favors both the HMMWV and CUCV since they will be diesel powered. The M151 requires gasoline.

Economically, the decision to eliminate the M151, as well as the M274, M561, and M880, saves on logistics costs by reducing the numbers of vehicle types in the Army. Some of the savings factors are reduced repair parts, purchase and stockage, reductions in maintenance man-hour requirements, as well as mechanics training.

In summary, the substitution of Jeeps for HMMWV's is unwise from both a military as well as economic standpoint. The M151 Jeep does not meet our operational requirements and retention would not alleviate the operational deficiencies and problems that the preferred fleet alternative was designed to solve. The result would actually be greater vehicle proliferation with resultant increased cost to the Army.

HIGH MOBILITY MULTIPURPOSE VEHICLE (HMMV)

Senator LEVIN. The Army begins procurement of the HMMV in fiscal year 1983. What is the estimated cost of this program through fiscal year 1987?

General MERRYMAN. The Army procurement funding profile for the high mobility multipurpose wheeled vehicle (HMMWV) from fiscal year 1983 through fiscal year 1987, is as follows:

Fiscal year:	*Millions*
1983	38.6
1984	173.7
1985	205.8
1986	339.2
1987	437.5
Total	1,194.8

Senator LEVIN. To what extent will procurement of the HMMV allow consolidation of the Army's fleet of tactical vehicles?

General MERRYMAN. Acquisition of the High Mobility Multipurpose Wheeled Vehicle (HMMWV) and the Commercial Utility and Cargo Vehicle (CUCV) provide for complete consolidation of the Army's light load tactical wheeled vehicle fleet—¼ through ¾ ton. Additionally, selection of the ¾ ton payload category reduces the number of tactical vehicle payload classes to four (4) (less commercial line haul tractors, certain special purpose vehicles, and equipment transporters). Vehicles replaced in the light load fleet are the M151/M718 ¼ ton truck, the M274 ½ ton truck, M561/M792 ¾ ton truck, and M880 series commercial fleet.

Senator LEVIN. What is the approximate cost savings in the Army that consolidation of the tactical vehicle inventory through purchase of the HMMV will provide?

General MERRYMAN. Consolidation of the ¾-ton payload class with the High Mobility Multipurpose Wheeled Vehicle (HMMWV) and the Commercial Utility and Cargo Vehicle (CUCV) will provide substantial benefit to the Army in increased tactical capability and a reduction in cost. The Tactical Wheeled Vehicle Fleet Requirements Study projected a total 20-year program cost saving of $1.02 billion in fiscal year 1982 dollars as a result of the selection of the ¾, 2½, 5 and 10 ton tactical fleet alternative.

Senator LEVIN. To what extent will the numbers of vehicles in the tactical vehicle inventory be reduced through purchase of the HMMV and inventory consolidation?

General MERRYMAN. There will be reductions over the years in the kinds of vehicles in the tactical wheeled vehicle fleet as a result of the elimination of the M151 ¼ ton, the M274 ½ ton, the M561 ¾ ton, and M880 ¾ ton, and the M416 ¼-ton trailer. Additionally, the Tactical Wheeled Vehicle Fleet Requirements Study projected a reduction in the Army's total vehicle requirements of nearly 6,000 trucks and over 30,000 trailers as a result of the selection of the ¾ ton alternative and the introduction of the High Mobility Multipurpose Wheeled Vehicle (HMMWV) and the Commercial utility and Cargo Vehicle (CUCV). However, on-hand asset totals will not decline. This is because of the fact that we are currently short of our tactical light load fleet requirements and, unfortunately, will continue to remain short for a number of years.

Senator LEVIN. Is the competitive evaluation on schedule? What is its status? What criteria are being evaluated? Will the Army be able to decide on schedule?

General MERRYMAN. The High Mobility Multipurpose Wheeled Vehicle (HMMWV) program is on schedule. The contractors are currently in the prototype build-up phase of the schedule with prototype delivery scheduled for the end of April 1982. Developmental and operational testing will begin in May 1982 and run through September 1982. Criteria for vehicle evaluation include developmental and operational testing to determine the merits of the vehicles against the performance specification and a price competition for production proposal for those contractors successfully completing the test phase. The Army continues to remain on the schedule we announced on February 25, 1981 and anticipates a decision as to the winning contractor in December 1982.

OTHER PROCUREMENT

Senator LEVIN. What would be the effect of 5 percent reduction (or $228 million) to the Army's other procurment account in fiscal year 1983? What would be deferred?

General MERRYMAN. The Other Procurement, Army appropriation is the account which provides tactical and support vehicles, communications and electronics equip-

ment, and other support equipment such as generators, construction equipment, materiel handling equipment, field medical hospitals, etc. The programs within this appropriation are structured to provide a balanced support to our combat forces. The programs funded in fiscal year 1983 will provide only a limited increase in fill of our requirements and a very minimum amount of equipment to cover priority requirements for replacement of over-age, obsolete assets. Any percentage reduction to this appropriation would serioulsy jeopardize the Army's readiness and defer fill of long standing support equipment shortages.

Senator LEVIN. How much is in the Army's other procurement account for the first-time purchase of communications and electronics equipment for fiscal year 1983?

General MERRYMAN. First time purchases of communications and electronics equipment for fiscal year 1983 amount to $234.7 million. The majority of this amount represent transition from RDTE to scheduled production programs.

M113 SPEED

Senator LEVIN. In a typical combat engagement, what is the maximum speed of the M113 armored personnel carrier?

General MERRYMAN. The maximum speed of the M113A2 on a straight land-surface road is 40 miles per hour. Its cross-country speed is 19 miles per hour. A discussion of the influence of terrain and a combat environment on maximum speed is found below.

BRADLEY FIGHTING VEHICLE SPEED

Senator LEVIN. What is the maximum speed under the same conditions for the Bradley Fighting Vehicle? If these speeds would vary by type of terrain being covered, what is the range of typical combat speeds of each vehicle?

General MERRYMAN. The maximum speed of the Bradley Fighting Vehicle on a straight hard surfaced road is 42 miles per hour. Its cross-country speed is 22.8 miles per hour.

A comparison of speeds for the M113 and Infantry Fighting Vehicle (IFV) for a typical combat engagement would not be meaningful, for nothing is typical about a combat engagement. It is meaningful to compare the parameters of each vehicle that contribute to the ability of that vehicle to move on any battlefield. The most important of these parameters are:

a. Ground Pressure. The lower the better for this parameter, since it would determine how far the vehicle will sink in mud, sand, etc.

b. Vertical Wall Climb. The higher the better, for this measures the ability of the vehicle to get over obstacles (rocks, trees, uneven terrain, etc.)

c. Trench Crossing Width. Self-explanatory.

d. Side Slope Capability. This important parameter measures the ability of the vehicle to "contour" terrain features. The higher it is, the greater the choices available for route selection and the greater protection afforded by available terrain.

e. Swim Speed. This is important because of the vulnerability of armored vehicles in water.

f. Power to Weight Ratio. This is a measurement of acceleration, speed of hill climb, and overall flexibility (pull loads, other uses).

A comparison of M113 and Bradley Fighting Vehicle parameters is depicted below:

Parameter—Units	M113	Bradley
Ground pressure—PSI	7.9	7.6
Vertical wall climb—inches	24	36
Trench crossing—inches	66	100
Side slopes—percent	30	40
Swim speed—mph	3.6	4.5
Power to weight—hp/ton	17.5	20.4
Acceleration—seconds (0–30 mph)	31	14.7

The chart clearly shows the Bradley Fighting Vehicle superiority in each category. This translates to a much greater "combat speed" than the M113. Of greater importance is what this means to an infantryman. In the Bradley Fighting Vehicle, he can:

a. Move from one covered position to another and spend much less time exposed to fire.

b. Select a more covered and concealed route and use terrain more effectively.

c. Remain oriented while travelling so he is much better prepared for combat if forced to dismount.

d. Cover his movements by placing effective suppressant fire on enemy positions using the stabilized 25mm gun.

e. Spend less time exposed to fire during water crossing operations.

In short, the Bradley Fighting Vehicle can get there faster and safer than the M113, regardless of the terrain or combat environment.

Senator GOLDWATER. The meeting is adjourned.

[Whereupon, at 10:30 a.m., the committee adjourned subject to the call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

FRIDAY, MARCH 5, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

ARMY M1 MAIN BATTLE TANK

The subcommittee met, in open session, pursuant to notice, at 9:02 a.m., in room 235, Russell Senate Office Building, Senator Barry Goldwater (chairman) presiding.

Present: Senators Goldwater, Humphrey, and Levin.

Staff present: Robert S. Dotson, George K. Johnson, Jr., José E. Martinez, and Carl M. Smith, professional staff members; Paul C. Besozzi, minority counsel; Tamara L. Jones, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Buzz Hefti, assistant to Senator Warner; George Kohl, assistant to Senator Humphrey; Jim Dykstra, assistant to Senator Cohen; Jon Etherton, assistant to Senator Jepsen; Don Imgram, assistant to Senator Quayle; Frank Krebs, assistant to Senator Cannon; Gray Armistead, assistant to Senator Byrd; and Peter Lennon, assistant to Senator Levin.

OPENING STATEMENT BY SENATOR BARRY GOLDWATER, CHAIRMAN

Senator GOLDWATER. Today the Tactical Warfare Subcommittee meets to receive testimony on the Army's M1 main battle tank. We welcome Mr. James Ambrose, Under Secretary of the Army, Gen. Glenn Otis, Commanding General of the Army's Training and Doctrine Command, Maj. Gen. James Maloney, Deputy Chief of Staff for research, development, and acquisition, Maj. Gen. Duard Ball, the M1 program manager, and from the General Accounting Office, I am pleased to welcome Mr. Walton Sheley, Director of the Mission Analysis and Systems Acquisition Division.

I also want to extend a welcome to the members of the press and the electronic media. You are all welcome.

The issues I expect to address today are well known to all of you. If they are not, you can pick up a recent copy of any major newspaper and you will find them. They are sure to be there. They include the cost of the tank, the durability of the transmission, the reliability of the tank measured in terms of breakdowns and maintenance requirements, the possibility that the Army may be considering

future modifications of the tank, and the M1's companion bulldozer, the armored earthmover or ACE.

That last one perhaps, because it is the most recent one to be embraced by the press, is particularly interesting.

Before this hearing adjourns I expect we will all know whether our previous tanks, the M60 and M48 had the ability to dig in, whether the M1 will have more or less capability in this area than its predecessors, whether the modern tanks or our allies can dig in or whether they rely on their own ACE's, and whether Soviet tanks require the assistance of an armored earthmover.

I also find particular interesting those reports about possible modifications of the tank. Let me put this issue in perspective.

For the past 20 years we have watched the Soviets conduct the most massive peacetime military buildup in the history of the world. Over that time we have watched them make a number of very smart decisions.

One of them is to make regular evolutionary improvements to their tanks. And we admire them for it because it makes good military sense. We have followed the Soviets through the T-54/55, T-62, T-64, and the T-72 and we believe that they are now developing one even more capable than the T-72. But when our Army announced that they will consider evolutionary improvements to the M1, they are pilloried by the press.

Where is the fairness?

We applaud the Soviets for their wisdom, yet we condemn our own Army for considering the very same approach. That is a double standard that I cannot endorse.

On the issue of costs, I have seen more irresponsible statements claiming to show the cost of the M1 than I have seen on the B-1 and F-18 put together. And that is some stiff competition.

One article, published less than 2 months ago, reported the cost of the tank at $30 million a copy. That is $30 million. I have to wonder if there is not some standard of professionalism that would prevent that kind of irresponsible distortion from being published. Apparently there is not.

I am aware that problems still exist with the M1. The question that we are faced with is whether or not these problems are so great that we should defer production of the tank until they are solved. In considering that decision we must bear in mind the impact of such a deferral on the ultimate cost of the tank and also the impact on our defense posture.

In just a minute we will hear from Mr. Walt Sheley from the General Accounting Office. I want to commend him for the efforts of the GAO in providing Congress with their periodic independent assessments of the progress of the tank. I consider these reports to be very professional and quite useful.

I will say, gentlemen, that I have watched the tank, ridden in the tank, and have fired the gun. I have great confidence in the machine if and when we get all of the little bugs ironed out of it. We also need to get a thorough understanding of why the costs have gone up so greatly. That is our major purpose for the hearing this morning, so I would like to call on Mr. Sheley, but I would like to first recognize our senior witness, Secretary Ambrose.

Secretary AMBROSE. Good morning, Mr. Chairman, and thank you very much for the opportunity to address this most important subject. I will have a few remarks to make myself on this before turning the session over to the expert witnesses we have here, led by General Otis, but I will turn it back now to Mr. Sheley. Thank you.

STATEMENT OF WALTON H. SHELEY, JR., DIRECTOR, MISSION ANALYSIS AND SYSTEMS ACQUISITION DIVISION, U.S. GENERAL ACCOUNTING OFFICE

M1 TANK (ABRAMS TANK)

Mr. SHELEY. Thank you very much, Mr. Chairman. I am pleased to be here this morning to present GAO's views on the Army's M1 tank program, the Abrams tank.

We have followed the M1's progress through its development and into production and have issued several reports on the tank dating back to 1976. Over this period we focused attention on a number of wide-ranging issues.

Our reviews in the last 3 years have concentrated on three specific areas: Operational and development testing, particularly, the M1's showing in the areas of reliability, maintainability, and logistic supportability; the Army's efforts to improve the M1 power train's durability, the most critical area in which the tank has not met the Army's requirements; the possible consequences of large-scale M1 production before its durability problems are resolved.

We believe testing has demonstrated the tank's excellent potential in most of its critical performance areas, including firepower, armor protection, speed, and agility. However, some of this capability could be lost due to problems with the power train. Basically, our position has been that the M1 should be produced in limited quantities until the power train could be improved to where tests show it will meet the Army's requirement. Otherwise there remains some risk of building up an inventory of M1 tanks whose power train components may need frequent maintenance or replacement.

The Army disagrees. It would accept the tank with its current capability while embarking on an improvement program. Further, the Congress has indicated its approval of putting the tank into full production by providing funds in the fiscal year 1982 Defense Appropriation Act for a buy of 665 tanks, the number requested by the Department of Defense.

We understand how the urgency of fielding the new tank, to help redress some of the Warsaw Pact's advantage in conventional forces, could become an overriding consideration in the decision to go to full production. Consequently, we would like to limit our comments today to matters we believe have some relevance to the M1's future.

One is the continuing effort to improve the power train's durability. If this is not successful it could presage an expensive maintenance program for the tank. The Army's decision to press for full production was largely influenced by the report of a blue ribbon

panel, drawn from industry and Government, which was convened again last summer to assess the power train.

The panel believed the power train would eventually not only meet, but even exceed by a considerable margin, the Army's durability requirement. This requirement is expressed as a 50-percent probability of negotiating 4,000 miles without a durability failure. The Army reported that in operational and development tests last year the M1 achieved a probability of 37 percent.

The blue ribbon panel's projections of success for the power train were based on assumptions that several significant modifications it suggested would be made successfully. Most of these concerned the power train's turbine engine. The Army has informed us that it has started actions on all of the panel's recommendations. However, Army testing of the M1 with these modifications is not scheduled until later this year and we understand, from discussions with Army officials, that some of the problems cited by the panel have not been completely resolved.

In this connection the Army is planning to test M1 tanks outfitted with a 1,500-horsepower diesel engine. In addition, the Army will run tests this year with tanks containing the turbine engine. The Army has a contract with Teledyne Corp. for the development of a diesel engine. If the test results show the turbine engine still to be a problem, and if the diesel shows good potential, we suggest a comparison of the two engines from the standpoint of cost and performance might be in order in considering which engine to select for the balance of the production run.

The Army is not inclined to do this. Army officials say it would take another 4 years to complete development and to operationally test the diesel engine, and that the cost to do this, in addition to the cost to modify the tank to accommodate a different engine, would be substantial. The Army estimates that over 3,000 M1 tanks will have been produced before a diesel engine could meet Army acceptance tests.

In prior discussions the diesel engine contractor said it could complete development in about 2 years. In any case, we agree with the Army that the diesel engine should be put through operational testing if it is to be considered for production.

A second issue that still concerns us is the ultimate cost to operate, support, and maintain the tank. As with some other weapon systems, particularly those whose development is accelerated to meet urgent requirements, the M1's supportability considerations were subordinated to the objective of maintaining a schedule so that deployment of the M1 would begin by 1982.

Consequently, data available, when we were reviewing the M1 during its operational testing in 1981, was too limited to fully evaluate the tank's supportability in terms of logistics requirements and life-cycle costs. The reliability of test equipment, the adequency, and completeness of training manuals, the tank's high fuel consumption, and the maintenance burden were some of the supportability areas that obviously needed improvement.

The Army has informed us that progress has been good in some of these areas. For example, the realibility of the test sets is said to have been considerably improved.

Army reports it has been running a successful training program with the first tank units delivered to Europe for training purposes. However, we have not made an assessment of this program or any of the Army's other actions relative to the tank in recent months.

In summary, there are some important M1 deficiencies that the Army has been addressing and for which improvements are underway. Testing later this year should furnish some answers as to how far the Army has progressed in solving these problems.

Senator GOLDWATER. Thank you, Mr. Sheley.

M1 TRANSMISSION DURABILITY PROBLEM

Could you give us the GAO's independent assessment of the likelihood of solving the transmission durability problem if the blue ribbon panel recommendations are followed?

Mr. SHELEY. Well, they made recommendations in the past, Mr. Chairman, the same panel, and they have been rather optimistic that the problems would go away. I would hope that we don't see the same thing happen this time. This is the third panel that has been convened to study this problem and the transmission, as I understand it, doesn't seem to be as much of a problem as it was in the past.

It is primarily now the turbine engine that is giving problems, in the power train unit itself.

Senator GOLDWATER. I would like the Army witnesses to address themselves to that question when you are testifying.

Mr. Sheley, has the GAO determined the impact that production deferral would have on the cost of the tank?

Mr. SHELEY. No, sir, we have not.

Senator GOLDWATER. Has the Army done that?

Secretary AMBROSE. No, sir.

Senator GOLDWATER. Could somebody give us some estimate when they get up to testify.

Secretary AMBROSE. I will make some comments on that, Senator.

Senator GOLDWATER. I imagine that the Army will cover the technical aspects that Mr. Sheley did not cover.

Thank you, Mr. Sheley.

Secretary AMBROSE. You can proceed.

STATEMENT OF HON. JAMES R. AMBROSE, UNDER SECRETARY OF THE ARMY, ACCOMPANIED BY GEN. GLENN K. OTIS, COMMANDER, U.S. ARMY TRAINING AND DOCTRINE COMMAND; MAJ. GEN. DUARD D. BALL, PROGRAM MANAGER FOR THE ABRAMS TANK SYSTEM, MATERIEL DEVELOPMENT AND READINESS COMMAND; AND MAJ. GEN. JAMES MALONEY, DEPUTY CHIEF OF STAFF FOR RESEARCH, DEVELOPMENT, AND ACQUISITION

Secretary AMBROSE. Mr. Chairman, I don't have a written statement. The bulk of the comments and testimony I will leave to the other witnesses, but I would like to say a few words before they get started, particularly as to my own involvement.

When I came into the Pentagon late last summer, it was clear that the tank was both the most important new weapons system, the largest one, and the one with the most visibility, so I immedi-

ately concerned myself with an assessment of its performance, the results of the test that you have all heard so much about, the costs of this program, the capability to produce it, and the prospects of fielding the tank successfully.

I won't go at this time into a great deal of detail except to say that I have satisfied myself, by riding in the M1 and firing it as you have, that this is a remarkable weapons system; that its performance is correctly represented; and that there has been a great deal of misunderstanding and misinterpretation of early test results on the few preproduction tanks. There has been an erroneous extrapolation of those test results to the production items once the fixes indicated by those tests have been introduced—which after all are for the purpose of finding out what, if anything, needs to be fixed.

I am confident that the production articles will meet the specifications in all particulars except the track life. I will comment in a moment about the track life.

I had heard a great deal about $500,000 tanks and tank costs ranging in all of the number series including the one that you have referred to earlier. I asked General Peixotto, the Army Comptroller, to make a complete and separate accounting of the costing of this tank from the program's beginning. His report, which has not previously been published, is contained in this folder and I will make it available to the committee.

Just before the meeting I offered to do the same with Mr. Sheley, so that everyone can see exactly the cost data from which, unfortunately, you can get in almost any result you wish, depending upon how you combine inflation factors, reference points, congressional actions, OSD actions, and changes in the product, et cetera. I am satisfied that the result of this exhaustive accounting review is, first, that you can trace the numbers to documents and to facts and not to speculation and, second, that the account will show that, exclusive of inflation, which has hit everything, the changes in this program have been quite modest, particularly modest in comparison with the run of DOD programs.

Overall the growth of this machine due to performance problems, or to technical changes to correct problems, and to product changes induced to improve the product deliberately have to this point in time resulted in a product increase of about 15 percent. The remainder of the increase in cost has been the inflation which has hit everything.

The other witnesses can give you the numbers that go with those statements.

This program in fact has been under very good cost control compared to the bulk of the Department's programs. Production has been a problem. Production still is a problem. We are just now approaching the initial rate desired in the tank factory of 30 tanks per month. We are beginning to introduce the second factory in the Detroit area which will bring, between the two of these, production up to 60 tanks per month.

As I say, we have just achieved the 30-tank-per-month level and it has been a struggle. Engines continue to be behind the desired production schedule and more work is needed there. The fire control system is just meeting the schedules, so all told, it is a pro-

gram in which continuing attention has got to be given to maintaining and improving the production schedule and performance.

Parenthetically, I should say that to stop production or to slow it down for some period of time would not only increase costs substantially, but also defer to another time resolving the production effort to the point where we can be assured of steady production. We would just be postponing the date of reckoning when we would have to find out what other problems there may be in bringing production on to full line.

Finally, I think that one of the very good stories with the Abrams is the success that the Army has had in fielding this tank. They have put this very elaborate and complex instrument, fire control systems, turret drives, guns, and the like—they have put this into Europe, accomplished the training, performed the maintenance, and conducted the general fielding in a remarkably smooth way.

I think you will find, and I certainly invite the GAO to come and see for themselves, that this has been a real success story.

The last reason that I came down today to participate in this hearing is that there is an immediately prospective sale of the main firm, Chrysler Defense Industries, to General Dynamics. It has been my responsibility for the Army to watch over that prospective sale in such a way as to insure that it did not cost the Government anything and that it did not interrupt the production or the quality of the product that we were getting. I am satisfied and the Army is that we have succeeded and will succeed in accomplishing those things.

So having said that much for the moment, I may choose, Mr. Chairman, to comment from time to time, and I would like to turn the meeting then to Gen. Glenn Otis. I think you know General Otis undoubtedly much better than you know me, and his background in the Army, and participation in this program. I think he is more qualified to speak to all of the questions that you raised and any others that may come up.

Senator GOLDWATER. Before we start with General Otis, let me ask you, if General Dynamics buys the M1 division, will they move the manufacturing from Detroit or Michigan to some other place?

Secretary AMBROSE. No, the manufacturing at the prime tank level is in two Government-owned plants, one in Detroit and one in Lima, Ohio. All of the production equipment is Government-owned. General Dynamics will operate these plants and the work force will be largely the work force that has been there.

Senator GOLDWATER. Thank you.

General Otis, we welcome you and just for the record I want to make it clear why this committee has a special interest in this particular weapon. The tank is the most effective weapon that we have on the ground. The Russians now have 50,000, and we have about 14,000, and they are making about 3,000 a year.

According to your testimony we are going to get 700, so even with the completion of this contract of 8,000 we are still less than 50 percent of the tanks that the Soviets have. This is very important to us, and it is why we are interested in the cost. We do not want to see anything happen that might cause the tank to cost more.

I remember when we started with this tank it was a $600,000 project and now it is up to about $3 million. So, General Otis, we are very interested in the Army's answer. We will have some questions as you go along.

General OTIS. I am pleased to be here to discuss the M1, the Abrams tank.

Before I address the tank overall I would like to point out that the Abrams itself is only one part of that total modern capable Army that we are trying to build. In fact, the Abrams is to be the high end of the high/low mission of tanks in our inventory. You in Congress have long pressed for a combination of systems that will build upon one another to improve the overall effectiveness of the entire Army.

The Abrams is one part of that effort. In combination with the infantry fighting vehicle, the advance attack helicopter, some new intelligence systems, and some revisions to our tactical doctrine, which emphasize fire power and maneuver, the Abrams tank will give us an Army capable of defeating a sophisticated enemy and certainly one more capable of deterring war.

TACTICAL DOCTRINE MANUAL

Senator GOLDWATER. Let me make a comment. The new tactical doctrine manual is a very fine piece of work. I think it is going to be ready for publication this next month, isn't it?

General OTIS. It is now in printing, sir.

Senator GOLDWATER. Well, I am pleased that you changed that. I am particularly pleased with the stress on the importance of keeping the American public aware of everything that we do, every move we make. That is a great step forward because, as one of the authors pointed out to me, there will be no more Pearl Harbors. Any war that we have, and God knows we do not want one, we will have to have it with the backing of the American people. This is the best way to do it.

Go ahead.

General OTIS. Now let me talk, sir, about the progress we have made in the M1 tank program and where we are headed. The first M1 battalion has been fielded at Fort Hood and has successfully completed that difficult operational test III at both Hood and Knox. Chrysler has delivered 322 M1's to the Army and we are currently fielding the M1's in Europe.

The first M1 tank battalion in Europe began training on the 15th of January of this year. Their training will be completed in about 2 weeks. I can tell you from the report I received the day before yesterday, it is going very well.

Senator GOLDWATER. Have the Germans used this tank yet?

General OTIS. No: but they will. They will certainly do some cross training with us, Mr. Chairman, because we do that as a matter of routine in Germany.

Senator GOLDWATER. I would like to be kept aware of what they think of the tank.

General OTIS. Yes, sir.

In addition, tanks for the second tank battalion in Europe are enroute to Germany now. The soldiers using the tank in Europe are

extremely enthusiastic over its capability and in fact they are equaling the enthusiasm we found from the soldiers at Fort Hood, two of whom sit behind me here today, Senator Goldwater.

The Soviets have continued to field new tanks as you pointed out and it is imperative that the United States have a tank which can survive on a battlefield against a broad spectrum of antitank weapons, not just against tanks. We plan to have a sufficient number of them. Let me show you what our general plan for the tank is and I will do that with the help of this visual chart.

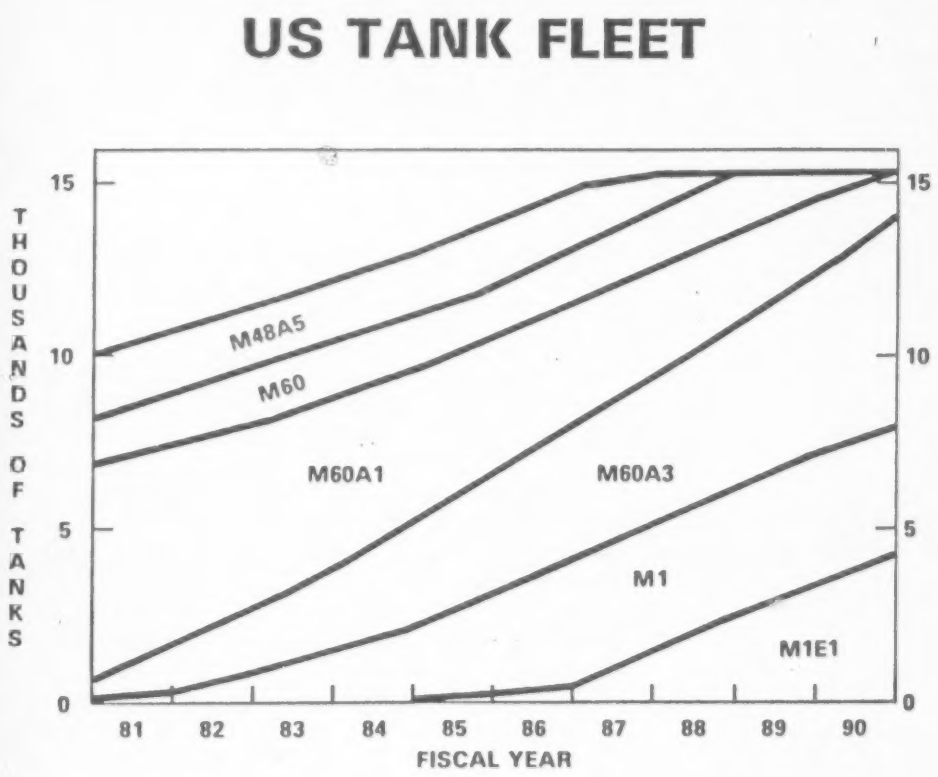


CHART 1

What the chart will show, and I will describe it as we go, is that our objective is to improve that current fleet of tanks over time as we did the M1. The M1 on the bottom will be the main punch. Now looking at the chart, sir, the fiscal years are across the bottom and the tank in numbers of thousands on the vertical axis. This shows over time that the M48A5 will still be in the inventory in some numbers, and the M60's without improvements in some numbers until about 1988, and the M60A1 and M60A3 will be in the inventory well into the late eighties and finally we will convert the A1s to an A3 version so that by 1990 the entire fleet will consist primarily of M60A3's, and fully capable new M1's.

Senator GOLDWATER. Let me ask you, because I don't like this stretchout in these tanks, but have you explored the possibilities of stepping up the rate of manufacture?

General OTIS. That has been explored in the past, Mr. Chairman, and I would like to turn it over to the project manager, General Ball, to address the specifics.

General BALL. Senator Goldwater, we have looked at the feasibility of accelerating our ramp up to get to 90 per month earlier. We consider that at this point in time our best assessment is one of very high risk to gain any substantial advancement in that rate of production.

We are exploring an alternative strategy which would procure some of the basic lead items, long-lead items, in a surge capacity to give us, for example, a 6 months' capability to step up production for a short surge. We believe we are now on a moderate risk schedule to acheive a sustained capacity of 90 a month in 1985, as we now project.

RUSSIAN TANK PRODUCTION

Senator GOLDWATER. Here is what disturbs me. It is now 1982 and in 1995, you will not have 5,000 of these tanks at that time. This by itself might not be disturbing, but everything I have been listening to in tactical warfare presents the same picture.

We are far behind the Soviets in almost every item and yet every chart shows that we are going to start moving up around 1990. Frankly I don't think that makes good sense. I don't want to see the Soviets get in a position of being able to blackmail us.

I think you would have to agree that we are getting to that point. You can explain it to me at some other time but I would like to know the details of why we cannot step that production up and why it wouldn't actually reduce cost or result in a little less money.

General BALL. I will be happy to do that.

Secretary AMBROSE. Thank you.

You referred to the Russian capacity of 3,000 tanks per year, which I think everyone agrees is a reasonably accurate minimum forecast of their abilities. In order to approach anything like that, a major additional investment is required in capacity. The difference between whether we achieve 90 or 100 or 125 is not going to approach the difference in basic capacity.

To my knowledge, the Defense Department has not considered trying to match the Russian capacity or anything like it, but I believe we would be talking about a number of additional billions of dollars required, both for facilities and for production, to come any where near closing that gap.

We are trying to close the gap of offense and defense capabilities by a combination of these tanks and other weapons systems: Attack helicopters, antitank weapons, and a variety of weaponry rather than matching them one for one with these tanks. That is a policy that of course can be questioned, and should be, to be sure that we are on the right course, but that is the way we are at the moment.

Senator GOLDWATER. I realize that, but every chart I look at is the same as that chart, and I do not know what good it is going to do us to produce a variety of weapons at the end of 8 years when we will still be behind the Soviets.

Let me give you one simple example. The Soviets build a fighter plane every 7 hours and we build one approximately every 24 hours. We are not buying enough aircraft this year to meet our rate of attrition and this is the third year in a row that we have done that. Sometime we have to change our thinking and I would like to see it start with the Army itself.

General Otis. Referring again to the chart, Mr. Chairman, I point out to you that for fiscal year 1983 there is no new M60 tank production for the Army nor is there beyond that time any new tank production of M60's. The last year of approved funding for the new M60's was fiscal year 1981.

Deliveries of all of those tanks, the M60 version, will be completed by June 1983. All tank production after that time in the M60 field will be for foreign military sales. Deliveries for the foreign military sales program will continue through November 1983 based upon our current orders.

Now, modifying the M60A1 to the M60A3 version calls for conversion of all the A1 tanks to the A3 version with its thermal night sight addition. The fiscal year 1983 budget of $162.9 million will provide for the procurement of 453 conversion kit sets. Now our M1 request this year will fund 776 M1's in fiscal year 1983 and the long lead time components required to buy next year's tanks.

The program shown here also supports our current production plan, which is to produce 60 tanks a month beginning in November of this year, and ramp up to 90 a month by February 1985.

Let me bring you up to date on the M1 program and its testing.

DT/OT III CURRENT STATUS

TEST	MILES/ROUNDS	STATUS
OT III		
FORT KNOX	14,000/2,800	COMPLETED 29 MAY 81
FORT HOOD	34,000/7,600	COMPLETED 30 MAY 81
DT III		
APG	36,000/5,000	COMPLETE MAINT EVAL 10 FEB 82
YPG	4,500/1,300	COMPLETED 13 NOV 81
CRTC	2,100/250	COMPLETED 17 MAR 81

Chart 2

In this visual I show what we have done with testing. First, this shows the developing test which is done by civilian crews in a laboratory type environment and then operational tests which are done

by Army crews, trained soldiers on the tanks out in the field, in the simulated combat environment.

What is shown here is the number of miles traveled by the tanks involved, and the number of rounds fired in those tanks and completion dates of testing.

Senator GOLDWATER. How many tanks does this represent?

General OTIS. That represents 54 tanks. Fifty-four tanks were tested total, operational and develoment tests, and environmental tests, and it took that period of time with those mileage and rounds indicated. So the tank has been tested, those 54 first production tank models have been through extensive testing.

If you add it up, during this testing we fired about 17,000 rounds in over 90,000 miles traveled. We now have solved the dust ingestion problem that you heard about from the tests of 2 years ago. As a matter of fact, we have not had an engine failure from dust ingestion since 1979.

The track-throwing problem which was a big issue then has also been solved. The M1 has consistently demonstrated excellent mobility and cross-country agility.

The latest tests, the one shown here, evaluated not only the automotive, the firepower, and the maintainability and durability of the Abrams tank, but they also evaluated the adequancy of the M1 training programs for crewmen and mechanics, and the tests of the logistic support for the M1 in an integrated tank battalion.

Now back in 1972, when the need document for this tank was first approved by Congress, the Army established what its requirements were. In 1975, those requirements were revalidated in a year-long study.

Shown here are those performance characteristics listed in priority order; these have been the Army's priorities since 1975.

PERFORMANCE CHARACTERISTICS - PRIORITY

1. CREW SURVIVABILITY
2. HIT PROBABILITY
3. TIME TO HIT/KILL
4. AGILITY
5. X-COUNTRY MOBILITY/RANGE
6. COMPLEMENTARY WEAPONS
7. SYSTEM INTEGRATION
8. EQUIPMENT SURVIVABILITY
9. PHYSICAL DIMENSIONS
10. SIGNATURE REDUCTION
11. LOG SPT, TMDE, SPT-EQPT

CHART 3

Let me talk to a few of those. First, crew survivability, in the M1 tank we have thoroughly tested survivability of the tank when fully loaded with ammunition, we have hit it with actual main gun rounds fired at the tank and it was able to drive away. 3,500 enemy threat rounds have been fired at the armor of this tank, to observe and record the results.

We have built into the tank fire suppression that can snuff out fuel and hydraulic fluid fires and do so rapidly.

Senator GOLDWATER. Let me ask you a question. We have seen reports that the hydraulic fluid catches fire. Is that true?

General OTIS. Yes, Mr. Chairman, the report that the hydraulic fluid will catch fire is true. It is also true that the hydraulic fluid in the M1 tank is a different one from what we used to have in the M60, what we call the old "cherry juice".

We went to a new hydraulic fluid, the same one that the Israelis now use, based upon our observations and theirs of that 1973 war. It is much less volatile and flammable. But it will burn.

Senator GOLDWATER. What is your PSI on your hydraulic system?

General OTIS. I am sorry, I don't understand your question.

Senator GOLDWATER. The pressure.

General BALL. I will have to get the answer to that.

Senator GOLDWATER. I wanted to compare it with other hydraulic systems that we use throughout the service.

[The information follows:]

The hydraulic system for the M1 tank normally operates at 1600 PSI ±150 PSI.

General OTIS. On the same point of the hydraulic fluid and the susceptibility to fire, in the M1 tank from the outset we designed those hyrdaulic lines to that they would be much better protected than they are in the M60 tanks.

Secretary AMBROSE. If I can just add to this hydraulic fluid business, there is an active program seeking a completely nonflammable fluid, but it hasn't been reached as you know, temperature conditions over a wide range and ability to act properly with respect to the seals and not corrode them or rot them out. So far one has not been found.

There are fluids that are used on commercial aircraft that more nearly approach the flammant characteristics desired, but they do not work in the tank environment over the range of usages. So we will continue that effort on an urgent basis.

We believe in the tanks today we have the most nearly nonflammable fluid that is available. That is confirmed by General Otis by the fact that the Israelis, who were most anxious to avoid this problem, are using the identical fluid that we are and it is used in all of their tanks.

General OTIS. I assure you, Mr. Chairman, it is our view and shared by many other Nations that the M1 tank is the most survivable tank in the world.

The second priority characteristic is hit probability. Now the hit probability for both first round and subsequent round firings on the tank has been superb, including the shoot-on-the-move capability.

Fort Hood crews regularly hit targets over 1 mile away while moving at greater than 25 miles per hour. Newly trained crews achieved greater than 70 percent round hits, at the end of the transition training, in February of 1982.

As an example, sir, in Europe one tank company, Charlie Company of the 64th Armored, just finished its training, and 12 of its 13 crews qualified on their first try after transitioning from M60 to M1.

In fact, even some vocal critics of the M1 were able to get in the tanks and hit three out of three at combat ranges after only a brief orientation, and she drove well, too, sir.

The third priority is time to hit and kill. Crews are able to hit two targets in less than 15 seconds, and that is our proficiency requirement. That is range, load, shoot and hit, two different targets, translating between the two and doing so in 15 seconds or less.

The thermal sight on the M1 tank speeds acquisition of the target, an important part of that time to hit and kill. As a matter of fact, the tank thermal sight is certainly outstanding at night, but is also usable in the daytime because it can see through some camouflage.

Senator GOLDWATER. What is the muzzle velocity of that cannon?

General OTIS. Depending upon the ammunition used, sir, it would be in the neighborhood of 4,900 feet per second.

Senator GOLDWATER. Are they still using the fin projectile?

General OTIS. The newest round is a fin-stabilized projectile with a discarding sabot.

The fourth in priority is agility. Let me define that, Mr. Chairman. Agility in this context means how fast the tank accelerates, how fast it decelerates and moves across country from cover to cover positions. It is not its road speed which is a characteristic we refer to as speed, but rather it is alacrity in the battlefield down at the tactical level where it counts to permit the crew to do its shoot and move and maneuver capability.

In the M1 tank we can accelerate from 0 to 20 miles per hour in less than 7 seconds. No tank will exceed that, and most will not come near it. That means from a standing start behind a covered position, an M1 can dash to cover a quarter of a mile away and then be able to stop rapidly.

Alacrity and agility means that you can stop quickly with a 60-ton monster, and again the M1 has that capability so its doesn't overrun its covered position. All this capability and agility adds to crew survivability as well as the tank's ability to fight.

In cross-country mobility and range the M1 has clearly greater speed than any of its predecessors. On the road it has achieved speeds that were thought unattainable just a few years ago. That takes not only a good engine transmission combination, but a complete suspension system for the smooth stable ride.

The M1 tank with its stowed fuel can go about as far on roads as the M60 and at 50 percent greater speeds. The M1 units because of their speed and agility can reposition on the battlefield in one-half the time of an M60 unit.

In the complementary weapons, what that refers to, Mr. Chairman, are the additional weapons other than the main gun. For example, we have three machineguns on the M1 in lieu of two on the M60 tank, and almost twice as much ammunition as the M60. The computer control of the coaxial machinegun allows it to target in at twice the range of the M60. Smoke grenade launchers are mounted on the M1 to be able to obscure it from enemy fire.

The commanders weapons station itself, as part of that complementary weapons system, is not as good as we want it and we are still working to get a better solution to the commanders weapons station. Nevertheless, the machinegun itself mounted there, complemented with one mounted at the loaders station on the left, provides close-in machinegun protection for the tank.

In system integration, No. 7 on the chart, we made sure that the crews could adapt easily to the tank, to both its fire controls, its driving and its other procedures. A clear case there is that we have been successful because training the crews in transition has turned out to be very easy.

Under equipment survivability, as differentiated from the total tank and crew survivability, we built in a graceful degradation to the fire control system. What I mean there is parts of the fire control system can be damaged by enemy action and the tank can still continue its mission and fire with good accuracy.

Senator GOLDWATER. Let me ask you how vulnerable is the M1 to a side attack? I imagine they can handle a head-on attack, but how about a side attack? Can they survive?

General OTIS. The short answer to your question, Mr. Chairman, is yes, on side attacks the M1 can survive. A longer answer would be that on the M1, as on almost all other tanks, because of the total weight envelope there is less protection than there is in the front. On the other hand, we made sure that the sides were protected from some of the more prolific close-in type of antitank weapons which are the ones against which the tank is most vulnerable.

M1 VERSUS H60 SURVIVABILITY COMPARISONS

Senator GOLDWATER. How would you compare the survivability of the M1 with the M60?

General OTIS. The survivability, or total survivability of the M1, is somewhere between a factor of 2½ and 4 times the survivability of the M60. That is not just armor, but that is a combination of all of the crucial survivability aspects we built in, to include its agility on the battlefield.

Senator GOLDWATER. Because of the new type of engine that you have been using, would that apply to a rear attack? Is a turbine more susceptible to attack because of its necessity of greater need for air, and possibly lighter armor in the rear, and is it more susceptible to attack than a diesel engine?

General OTIS. No, it is not, Mr. Chairman. The M1 tank is susceptible to attack in the rear, and so is the M60. The M1 is not more susceptible to enemy attack than the M60 at any point in its design, including the rear. The diesel engine and the turbine engine are lightly armored, both susceptible to attack.

Senator GOLDWATER. How about the tread? We have heard some complaints that the tread is light compared to the M60 and others? Is the tread vulnerable to attack?

General OTIS. The tank track tread is vulnerable to attack. However, no more vulnerable than any other tank.

Senator GOLDWATER. Is it true that it is light, and it does not have the bite that the M60 has?

General OTIS. No, sir, that is not true. It does have the traction of an M60, and in fact because of its high acceleration capability you need that kind of bite.

Now there is trouble with the track and I will address that here. The Army asked for the track to have a durability life of 2,000 miles. We have achieved half of that. Our best guess is that technology in this timeframe is not going to do any better than that.

Senator GOLDWATER. Where are we weak in the technology, is it metal?

Secretary AMBROSE. It is primarily in the ability to prevent chunking of the rubber. The rubber compounds that are known are simply not that strong. The reason for the rubber of course is not a wartime reason, but a desire not to chew up paved roadways in peacetime in going to the battlefield.

In fact, the track on the M1 tank has about the same lifetime as the track pads on the M60. There is no reason to suppose that anyone knew when that specification was written that they could achieve the specification. It was an ideal thing. The effect of this short track life is not an operational effect in battle. It is a lifetime and operational cost in peacetime thing.

The way to reduce that effect, we believe, is to change the mode of operation in peacetime to use more transporters to carry these tanks to their practice grounds and not drive them down the road on their own tracks. That is what the Russians do.

Senator GOLDWATER. How many miles can you expect under the present specification?

General OTIS. It is about 1,200.

General BALL. It is roughly 1,000 miles on the present track.

Senator GOLDWATER. Is the testing being done at Aberdeen or out at Fort Hood?

General BALL. That combines both testing, and we have gotten that average. We can get 1,700 miles in relatively benign conditions and we put it out in crushed rock and we will get possibly as little as 800 miles because of the rubber chunking. This is an average factor based on all of our present testing.

Senator GOLDWATER. I mentioned testing at Fort Hood and Aberdeen. Of course, the surface conditions are very different in the two places.

Do you experience more engine problems at Fort Hood than you do at Aberdeen?

General BALL. No, sir, I cannot trace specifically more engine problems because of those factors. We had early on in our testing a rash of engine problems at Fort Knox, and we have had some more recently at Fort Hood. We analyzed each of the failures and I do not attribute the failures in the engine to have any relationship to the operational profile or the terrain and conditions under which they operated the vehicle.

Senator GOLDWATER. I am primarily concerned about the difference in the terrain at Fort Hood where you have an opportunity to ingest a lot of dust and dirt.

Is that the difference between the two places?

General BALL. Sir, we have had no instance and no reason to suspect that we have had engine failure because of the dust ingestion.

Senator GOLDWATER. Let me get back to the track. Are you talking about the rubber track or the steel track?

General BALL. The rubber track, Senator Goldwater. It is a rubber pad, a pad molded to a steel shoe, and that is the track configuration for the M1.

Senator GOLDWATER. Would you use that type of track in combat?

General BALL. Sir, we have a very intensive track development program, hoping to reduce our operational and support costs for track, and one of the things we are looking to is a replaceable pad track as we use on the M60, so that if the rubber pads are good, the combat situation arises and you continue to operate quite effectively on the steel grousers after the pads had worn out. That is in development.

Senator GOLDWATER. Is your goal of 2,000 miles with the rubber track, or with the steel track?

General BALL. That was not specifically prescribed, the goal was 2,000 miles. The rubber track is a separate requirement.

Senator GOLDWATER. Senator Levin has just come in, and if there is anything you would like to ask at any time just sound off. We are just beginning to describe the chart.

Senator LEVIN. Thank you.

General OTIS. I turn now to point No. 9, the physical dimensions, and in that priority listing we demanded that the tank have a lower silhouette so that it will present a smaller target to the enemy. In fact, the M1 is 2 feet lower than the M60 with the same width. Therefore it presents a much smaller frontal area. Its weight, a part of the physical dimension, is 60 tons, and it can be transported on our transporters and the same bridges that take the M60.

No. 10 is the signature reduction. We talked to several parts of that. The signatures I am talking about are visual as well as the infrared.

In the visual case we have a smaller tank and we have eliminated the smoke plume that you get from the diesel by going to the turbine. There is a significantly reduced noise level, and although the noise of a turbine is certainly descernible, it is less than a diesel.

In the exhaust, being in the center of the tank, it is reflected downward to help reduce the heat signature for heat-seeking weapons.

Senator GOLDWATER. Let me ask you about the IR. We have heard some criticism, like any vehicle that uses an engine, or produces heat, that you produce significant IR signature.

How would your signature with the turbine compare with the M60 or with the diesel?

General OTIS. The signature of the turbine at 1,500 horses will be greater than the signature, the IR signature, of the M60 of only half that horsepower.

On the other hand, comparing the 1,500-horse turbine to a 1,500-horse diesel, it is not greater. As a matter of fact, deflecting the heat downward has produced less signature than that.

Secretary AMBROSE. I don't think it makes any difference whether it is higher or lower. The sensitivity of the IR sensors that are currently available is so great that it is possible to detect these tanks with IR detectors at ranges far beyond the weapons that would be used, whether the temperature was one or the other of these values.

In fact, you can find these temperature differences down in the few degrees. We are talking here about temperatures of 700 or 800 or 900 degrees and it really doesn't make any difference. It is an IR target whether you use a diesel or turbine engine.

Senator GOLDWATER. Unless the IR sensor is quite a bit higher, you are not going to detect the signature anyway, is that correct?

Secretary AMBROSE. We have been able to detect these tanks as I said, at ranges that are far beyond the ranges needed for the use of heat-seeking weapons, both the M60 and M1 so it is not a pertinent difference in our opinion.

Senator GOLDWATER. Thank you.

General OTIS. Finally, in the logistic support, the test measurement devices and the support equipment. Under that heading, Mr. Chairman, we had a whole series of different requirements and the next chart will show those.

RAM-D PARAMETERS/STATUS

PARAMETER	REQUIREMENT	ASARC STATUS
COMBAT RELIABILITY	320 MMBF	350
SYSTEM RELIABILITY	101 MMBF	126
SCHEDULED MAINTENANCE		
DAILY	.75 CLOCK HRS/3 MHS	.6/2.55 *
AT 1500 MILES	36 CLOCK HRS/64 MHS	23.6/37.6 *
UNSCHEDULED MAINTENANCE		
ORGANIZATIONAL 90 PERCENT	< 4 CLOCK HRS/8 MHS	3.3/5.9 *
DIRECT SUPPORT 90 PERCENT	< 12 CLOCK HRS/22 MHS	11.2/19 *
MAINTENANCE RATIO	1.25 MAN HR/OPER HR	1.34 * YELLOW
VEHICLE LIFE	6000 MILES	6000 +
POWERTRAIN DURABILITY	.5/4000 MILES	.37 RED
PRIMARY WEAPON LIFE	1000 ROUNDS	1000
TRACK LIFE	2000 MILES	1056 RED
ROAD/IDLER WHEEL DURABILITY	< 20 PERCENT IN 3000 MI	OK
SPROCKET LIFE	1500 MILES	1805

CHART 4

Now notice in all of them, listed in quite some detail the parameter itself, its name and then what the requirement was that must be met, and the status as of this time. The green means we have exceeded that capability, and the other numbers show where we are, and the two red ones are where in fact we have failed to meet those requirements.

General Ball, who will follow me, will describe this in more detail, but I might indicate here that out of those 22 listed characteristics, the first 11 and this 11, all but engine durability and track life and maintainability have been met or exceeded.

Senator GOLDWATER. Are they the three most important factors?

General OTIS. According to the Army, we put down the most important ones in priority order, as crew survivability and then hit probability and so on. There is no question that the engine durability, track life, and maintainability are all important.

Senator GOLDWATER. Garrett engines are made nearmy home, While I was out there looking at some new aircraft turbines, they said that they had been requested by the Army to develop a new turbine, but they didn't say what it was for.

Would it be for this tank?

Secretary AMBROSE. I think they were probably referring to the discussions we have been having about additional sources for this

tank engine. I am not aware that they have been requested to develop an entirely new tank engine.

TANK ENGINE DESIGN

Senator GOLDWATER. I don't know whether it was for a tank engine or something else and I was merely told by the development head that the Army had requested a design on a new engine.

Secretary AMBROSE. Possibly I should address that. We have had conversations with the management of Garrett and other corporations and we have visited the Garrett turbine engine plant in Phoenix to assess what they have there. We are exploring the possibility and feasibility of developing a second source to broaden our production base for the AGT-1500 turbine engine for the tank. I believe that is what they are referring to.

There has been no request, per se, to develop a new turbine.

Senator GOLDWATER. They didn't indicate that.

Secretary AMBROSE. I have had conversations with them.

Possibly this is a good a time as any to address the issue of the diesel engine. There is no existing diesel engine suitable for incorporation in this tank at that horsepower. There are development propositions. The diesel engine that has been proposed for such a development is itself pushing the state of the art very hard indeed. I think there is no better illustration of that than in the development testing of that engine.

There was a failure after a couple of hundred test hours or so that caused them to go back for a considerable amount of rework, and the resumption of that test program sometime later this year.

The point of that comment, I think, is that there is in our opinion no less risk in pursuing a development of an engine of that sort, pushing as hard as is necessary to accommodate the tank demands than there was in the turbine development at a much earlier time.

The proposition that is actually in front of us for this diesel engine is, I should say, a cost-plus development proposition for $10 million or something of that sort, to test two engines and it will take 2 years or so to accomplish that much, with no firm propositions as to the sequel of production prices or the time for getting the production into place.

Somebody has mentioned that it is $17 million, and numbers of that sort. So we are not looking at some engine that could be just dropped in out of the blue. I think personally that we are looking at the beginning here of incorporation of turbine engines in many ground automotive applications much the way we looked at jet engines coming into the airplane business a couple of decades ago, and as time goes on we will see more and more adoption of these.

The diesel for this service just simply does not look at all attactive to us at this point.

Senator GOLDWATER. I would agree with you. A 1,500-horsepower diesel would be a rather big chunk. I have seen a 300- and 350-horsepower diesel and they are not small. You would have to enlarge the tanks to take on a diesel, wouldn't you?

Secretary AMBROSE. Yes.

Senator GOLDWATER. Would that mean a lot more weight?

Secretary AMBROSE. There is quite a bit of cutting up that would have to be done and it just simply won't fit in the form factor that this tank is designed around.

General OTIS. To continue, Mr. Chairman, in summary, the tests have shown that we have not yet solved every M1 problem, but we have also shown that the M1 is a very, very good tank that meets or exceeds the key requirements to survive and win on the battlefield. The test data and the immediate need for the M1 both fully support rapid production and fielding of the Abrams.

I fully realize the concerns of Congress with the growth in costs of the M1. They are a fact and we aren't satisfied with the increases. But it is not only the M1 that has been hit with these increases. I will address the specifics of M1 costs in a moment, but I want to make a comment on cost discipline in general, from the perspective of the senior leadership of the Army.

On Wednesday Lieutenant General Merryman, Deputy Chief of Staff for Research, Development, and Acquisition, briefed you in some detail not only about the 22 improvements in cost control the Vice Chief of Staff of the Army had implemented in the Army, but those implemented by the Secretary of the Army as well.

The DOD and Army are dedicated to improved cost discipline. We fully appreciate the impact of cost growth on congressional support, the public, and the program we have instituted to modernize the Army and increase its readiness.

I would like to report that we have found a way to produce inexpensive equipment completely capable of defeating potential enemies—we have not. But we have taken steps to improve the weapon system acquisition process which we believe will help us better manage programs and control costs.

The Deputy Secretary of Defense and the Secretary of the Army have acted vigorously on this problem. Their guidance and the efforts of the Army are going to culminate in a better management system for weapon programs. We need the support of Congress in this endeavor. We have asked for such support through multiyear contracting and stable program funding.

Senator GOLDWATER. Let me ask you a question. Does your program manager keep in constant touch with you in this new committee setup, on every indication of a change in cost?

General OTIS. That is right and I would like General Ball to give his perception.

General BALL. Yes, sir, we have a very great deal of communication and dialog on costs and a great deal of reporting on the costs and indications of increase in cost. I am sure you are aware of many of the reporting systems that are in place.

In addition we have a new system called Program Management Control System that has been instituted in the Development and Readiness Command, DARCOM, which tracks all of my program costs from a baseline, and any changes from that base line I report to the DARCOM and Department of the Army level.

Senator GOLDWATER. That is most important. We were briefed on the different approaches of the Defense Department, and I think they are fine, if you can just get muleheaded and not allow politicians or outside people to influence you.

It is the only way I can see now of being able to reduce costs. On the AH-64, we have achieved good results just by getting a manufacturer and the Pentagon together. We would hope to see something similar in this.

Secretary AMBROSE. I think you are absolutely right. The key is discipline and not systems. But one point that General Ball just mentioned, I underline. Last fall or summer when I came into the Pentagon, I was astounded to be told that the program manager could issue an engineering change without having to produce a cost estimate and get approval of the cost before he went ahead. That has been stopped. That is part of this system. The system is all right, but the discipline of enforcing such things is what is really going to get us there.

I think it should be pointed out that in this contract there has been some discipline all along. The 1976 contract that was entered into for development contained the first 2 years of production options at a fixed price incentive type contract. Although options, when excercised, went to the ceiling of those contracts and there were provisions for escalation over and above that ceiling, as there are in many defense contracts, there has not been any increase in those contracts from that time in those terms.

The third year buy, that was entered into in October of last year was on a firm fixed-price basis, with no provision for ceiling type increase. There is an escalation provision. The stopping or reopening of that contract would have very serious consequences because it would give an opportunity for cost increases which are simply not warranted.

So I would be very reluctant to interfere with what I think is a proper contractural path here. This fixed-price contract itself was negotiated at somewhat less than the amount of money that was put in the budget for it, so there is cost discipline and cost improvement going on in this program.

IMPROVED COMBAT CAPABILITY

General OTIS. Although as we pointed out, Mr. Chairman, the M1 provides significantly improved combat capability and unequaled survivability for the crew, the Soviet counterparts have not been idle. Recent evidence of Soviet tank prototypes convince us that we cannot sit back smugly now that we have the M1 tank coming along.

The M1 incorporates the latest technology advances. It has signifiant growth potential for which evolutionary developments are planned. The improvements in survivability, fightability, and maintainability will enhance logistical supportability and sustain the M1's combat advantage over projected Soviet armor advances.

Since 1978, we have been adopting the German designed 120-millimeter tank gun and ammunition for introduction into production as the main armament of the M1. We have delayed introduction of the 120-millimeter gun until fourth quarter fiscal year 1985 to reduce technical and schedule risk in the ammunition development program and allow additional time for integrated system testing to insure the quality of the U.S.-produced gun and ammunition are equal to the M1's proven excellence.

This up-gun effort constitutes one of the major capitalizations on the planned growth of the M1 and will provide increased lethality needed to keep pace with anticipated advances in Soviet armor.

Senator GOLDWATER. Pardon me, will this be a rifled gun?

General OTIS. This will be a smooth bore, 120-millimeter gun, sir, and the ammunition will be fin stabilized.

Senator GOLDWATER. Do you find that fin stabilization is superior to the rifle stabilization?

General OTIS. Both have their pluses, Mr. Chairman. Over the years there have been professional debates about which is better. In point of fact we have a rifled bore on the 105, but we stabilize the projectile in flight with fins, a combination of the two.

We are achieving first-round hits at very long ranges. Smooth bores have also demonstrated the same. The wear of a tank gun is better with a smooth bore, but for some types of ammunition you need a spin, and therefore a rifled bore is good. So it is a trade off between the two.

Senator GOLDWATER. You can get higher muzzle velocity with the smooth bore, can't you?

General OTIS. Let me ask General Ball or an expert for the answer.

General BALL. Sir, we can get the muzzle velocity and it is a factor of the design of the weapon and not whether or not it is spin stabilized or rifled or smooth bore. But the smooth bore offers the distinct advantage for our long penetrator kinetic energy round which must be fin stabilized, of eliminating a requirement we have when we fire the rifle bore weapons to put a slip ring to permit the projectile to go out fin stabilized and let the slip take up the rifle in the spin.

General OTIS. Further advancement potential will be realized with the simultaneous introduction of our first package of preplanned product improvemetns on the M1E1. The addition of a hybrid nuclear, biological, chemical—NBC—collective protection system will improve crew survivability while fighting in a chemical environment.

A crew-cooling system will help maintain the soldier's combat effectiveness by reducing the likelihood of heat-induced casualties during fighting while wearing the NBC protective overgarments. Survivability will be further achieved by long-planned armor upgrades which will provide improved protection against Soviet antitank munitions.

These changes are scheduled for production and the first M1E1 tank will be produced in fourth quarter fiscal year 1985. The improved gun, ammunition, and survivability enhancement will counter postulated advances in Soviet tank development and help us maintain the technological advantage the M1 has provided so far.

The costs of the M1 program have received immense interest. However, much of the information printed results in apples and oranges comparisons.

In my discussion of cost I would like to pull out just the unit hardware cost of the tank itself and address that instead of the total program unit cost. The program cost includes many variable elements, whereas the unit hardware cost is the total cost of only

the tank hardware, full up with all its equipment included, as it rolls out the factory door and is accepted by the Government.

It is also our congressionally mandated management base line. We originally projected back in 1972 that we could produce a tank which would be bought for $507,000 in 1972 dollars. Our current estimate is that the tank unit hardware cost is $604,000 in 1972 dollars, which is 19 percent higher than the original estimate.

More than half of that is caused by the increased production rate and the significant added value we receive from the 120-millimeter gun and block modification product improvements we plan to incorporate into the program.

Consequently, the constant-dollar cost growth on this program is less than 5 percent. This chart summarizes the unit hardware cost history of the M1. The green band reflects the benefit of our planned, congressionally sanctioned product improvements and the yellow band portrays the rather minimal cost growth.

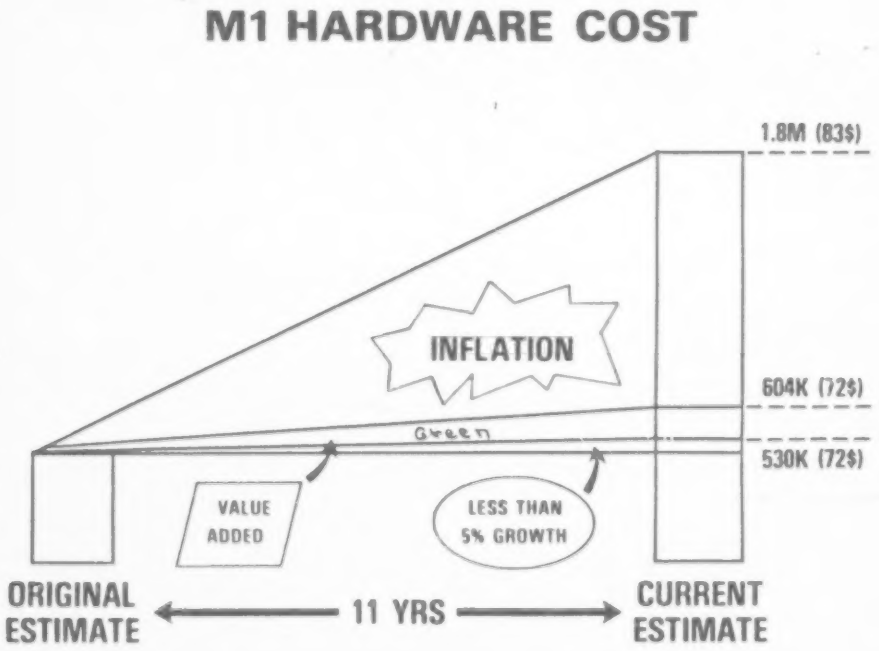


CHART 5

Now, the current unit hardware cost estimate is obviously more than $604,000. In fact, we now estimate the average unit hardware cost of all 7,058 tanks to be $1.8 million in fiscal year 1983 dollars. This difference between $1.8 million and $604,000 is inflation and is represented by the red band on the chart.

Senator GOLDWATER. Pardon me, but would you compare the current costs of the M1 with the M60.

General OTIS. I would like to ask General Ball to do that.

General BALL. Sir, on the apples to apples comparison hardware cost as described by General Otis, $1.3 million is the current cost

for an M60A3 tank, with $1.76 today, and $1.8 estimated in fiscal year 1983 for the comparable base line for the M1 tank.

Senator GOLDWATER. How about in this year's dollars?

General BALL. The comparable figures are about $1.7 and $1.2, and I would like to verify with Col. Pat Donovan, if I quoted his price correctly?

Colonel DONOVAN. That is very close.

Senator GOLDWATER. We have talked about $3 million for this tank, roughly.

How would you compare that $3 million with the cost of the M60?

General BALL. Sir, it would be very difficult and with your permission I would like to show a backup chart that shows how we get to the $2.77 million cost figure for the M1 tank.

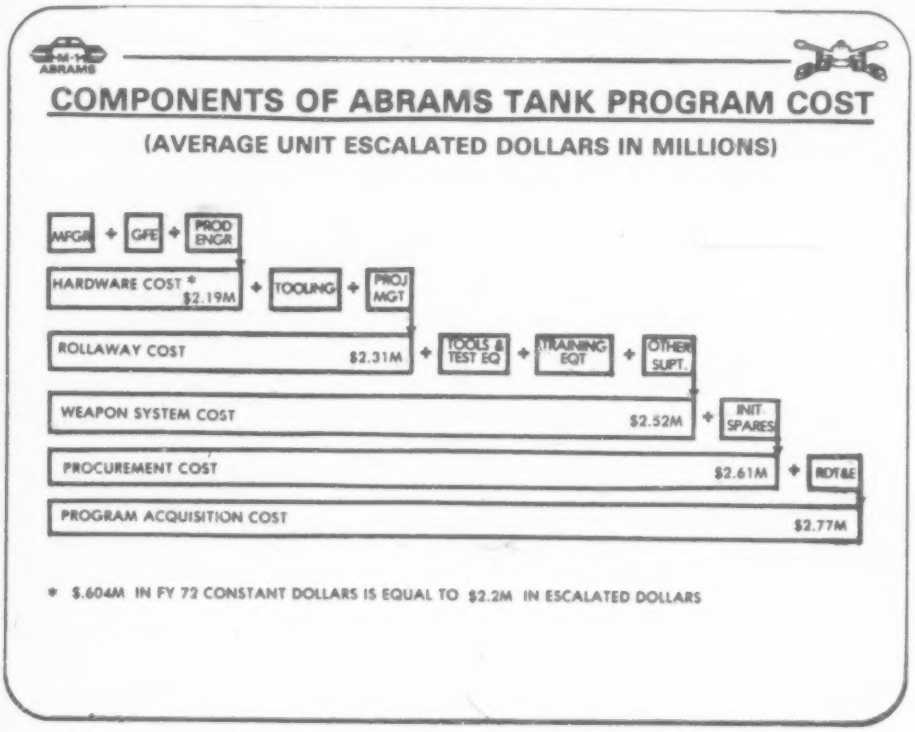


CHART 6

Secretary AMBROSE. We have tried to find the comparable numbers for the M60, but they are lost in the period of time that has elasped, because this number for the M1 includes all of the development costs. The M60 development costs have been spread over a number of programs over a number of years and they are not easily collected.

Senator GOLDWATER. Our biggest problem is that we have to spend this year's money.

Secretary AMBROSE. The numbers you have been given are the numbers that it would actually take to buy those tanks off the

floor, regardless of the spread of all of these other allocated type costs. That is $1.2 to $1.3 depending upon which year you are talking about, versus $1.7 and $1.8.

General BALL. I would draw an analogy if we quit producing M1's today, it would cost us about $1 million for each of the M1's that we had earlier planned to produce that we did not produce. We have $7½ billion in sunk costs. The entire cost, the research and development cost, the tooling for production, and our program costs and inflation assumptions out through fiscal year 1988 are $2.77 million per tank. I expect that $3 million is a rough estimate of $2.77.

All of those costs are incorporated and it is arrived at by dividing the 7,058 tanks into the total $18-plus billion program. Correction, it is a $1 billion program, also is not in any way to be compared to the original program, in whatever dollars we address.

As the Secretary has mentioned we don't have the comparable data for the original production facilitation cost for the M60 tank.

General OTIS. In summary, the cost of the tank, Mr. Chairman, the hardware cost to roll out today fully loaded and fully ready, is as that chart shows, $1.8 million. The majority of the cost increase over the $507,000 of 1972, is due to inflation, and this chart fairly displays the apples to apples comparison.

Senator GOLDWATER. How would you take a rate of inflation to apply to the tank cost and to the cost of the Bradley vehicle?

Secretary AMBROSE. You will find the comparable factors. It depends upon the years, but the numbers generally track inflation in the economy as a whole. The number that after the analysis I referred to earlier, most nearly appears to us to be a reasonable allowance for inflation over the period fiscal year 1972 to fiscal year 1983, is 3.04 times the procurement costs in 1972 dollars.

Let me say parenthetically, if I may, that although I believe this is an accurate portrayal of the facts of the matter, I for one am not satisfied that the Army and the Defense Department have done an adequate job of coping with inflation. To simply add that growth of inflation is not enough. As you well know, any business that lets it go at that rate would be gone in this time period. We have got to do a better job of fighting off those inflation costs and treating them as real costs with productivity improvements and the like.

I have committed quite a bit of my energy to accomplishing just that.

Senator GOLDWATER. As a former businessman, do you detect or suspect that any manufacturers in this field are taking advantage of the knowledge that we have a President who wants to spend a little more money on defense for our own good?

Secretary AMBROSE. I have not seen anything of that kind. I have not seen that kind of thing, Senator. I have seen the clauses which the Government uses in its procurement contracts and I consider them too soft because they simply add the indexed type inflation factors to the perceived real costs of the product. I think you have got to demand and expect to get productivity improvements that offset that cost. But I have seen no deliberate action on the part of contractors, or the Government either, for that matter, to take advantage of these indices.

Senator GOLDWATER. Would the GAO like to comment on that same question?

Mr. SHELEY. We are not aware of that either. I have to agree with the Secretary that there needs to be tighter control when you enter into contracts and using an index is not indicative of the inflated price of the hardware or the materials being purchased.

We have also noted, too, Senator, that the inflation rate in the defense segment of the economy has been somewhat higher than the general economy rate. I have seen estimates ranging where it is as much as double. In fact, the Defense Science Board made a study about 1 year ago, or 18 months ago, and at that time the general economy rate was running about 10 percent and their contention was that it was in the range of 20 to 22 percent for military space hardware.

Senator GOLDWATER. Has there been any study made on that by the GAO?

Mr. SHELEY. Only to the extent of verifying what the Science Board came up with, and we are reasonably comfortable with the figures that they used. They seem to be relatively representative of what we see happening in the real contracting world.

Senator GOLDWATER. Would you supply the committee with a copy of anything you have on that?

Mr. SHELEY. We testified last year before the other body, and we have a prepared statement along with some charts to show this, and we would be happy to furnish that to you.

Senator GOLDWATER. Thank you.

General OTIS. Let me assure the committee that we in the Army are as dedicated to cost control and are as concerned about the wise use of public funds as other citizens. We are doing our utmost to control, and in fact reduce, the cost of the M1.

Other than approved product improvements, and inflation, which has affected every element of our society and every segment of our economy, there has been minimal cost change from the original M1 estimates.

I would hope that these facts substantiate, as I believe they do, that the blistering media attacks of massive cost overruns on the M1 are not warranted. The country is receiving good value for its investment in this modern battle tank.

TANKS EQUIPPED WITH BLADES

I mentioned judgment questions earlier, certainly the whole question of equipping the Army is based on military requirements. It is not possible to keep subjective military judgment out of the process of designing equipment. This judgment is based upon the enemy, the task assigned to the military force, and historical experience, just to name a few.

Analysts often make very good recommendations about equipment needs. However, from time to time publication of real mistakes can distort perceptions of what the Army is doing. A prime example of this is the question of tanks digging themselves in.

No U.S. tank has a true bulldozing capability. Normally, one tank per company is outfitted with a blade. The blade is capable of clearing obstacles from a roadway and doing minor earthmoving.

Our older tanks have such a blade. The requirement for a blade on the M1 was stated in our material-need document in 1975.

As with older tanks, plans call for one M1 per tank company to be blade equipped. The blade is under fabrication now and will be tested beginning in August this year.

Senator GOLDWATER. Let me make a comment on that.

I was rather amused by the comments that came out about having to have a bulldozer to go along with the tank. My aide, who is a West Point graduate, tells me that part of their training included instruction on how to go ahead of the tank, with shovels, and do the same job. So this is just an improvement. Do the Soviets maintain about the same ratio of blades to the company or do they have a tank built with a blade permanently on it?

General OTIS. The Soviets have a tank with a blade. Let me ask General Maloney to address this point.

General MALONEY All T64 tanks in the Soviet inventory do have a blade in the front. That blade is permanently attached to the tank. It is allowed to swing down and then the force of the tank's movement forces that into the earth and as the tank moves several inches of earth can be scraped through the use of that blade.

Senator GOLDWATER. But the value is to remove damaged equipment out of the road or off the path?

General MALONEY. No, the Soviet blade is intended to do little digging. After a number of passes a hole can be dug into which the Soviet tank could position itself.

Senator GOLDWATER. We can use our blade for the same thing, can't we?

General MALONEY. The blades that we have had in the past, sir, are dropped onto the roadway or the earth and do not force themselves down except slightly by the geometry of the blade. They too can do little digging, and in the M1 blade, with the kit that we are looking at now, we looked at the Israeli approach to a blade for a tank. The Israelis attach this blade to their tank and use hydraulics to raise it and lower it.

We looked at their kit with the idea of putting it directly on our tank, but in fact the configuration causes the driver's vision to be blocked out, so it didn't quite do the job for us.

The blade that we will have will have a hydraulic raising and lowering device powered by the electrical system of the tank. We do plan to have one and it will be able to do clearing of the roadway or light earthmoving, not like a bulldozer, certainly, but light earthmoving.

Senator GOLDWATER. Thank you.

BATTLEFIELD BULLDOZERS

Secretary AMBROSE. I don't think sight should be lost of the fact that the battlefield needs bulldozers for all kinds of things. To pass on it for this purpose solely is to ignore all of the other things that have to be done with a bulldozer: bridge laying, road clearing, and pushing down structures, and trees, and so forth. There is a whole series of duties there that have nothing to do with tanks.

Senator GOLDWATER. That was one of our greatest achievements in the South Pacific.

General MALONEY. If I might add to that, the bulldozer, the armored combat earthmover, we intend to have 25 in a division. We intend to have in that same division about 348 M1 tanks and about 345 fighting vehicle systems and hundreds of other vehicles. The armored combat earthmover would do jobs across the division zone, supporting wherever it was required, so it is by no means a nursemaid to the M1 as the media has suggested.

Secretary AMBROSE. Maybe this is a good time to get straight the rest of the story. Since I am the one who did it, I think I can speak to it.

The proposition that came in front of me originally a few months ago was to buy some of these bulldozers and to prepare a technical data package for industry competition for the eventual purchase of considerably larger numbers. I felt that was too many to buy before going to competition.

I also felt that the timing of such a purchase was inimical to competition from other sources. The first manufacturer would be down the road further and he would be overlapping production in the competition period. So I cut the number down to 30. As a matter of fact, I said at the time, 30 or thereabouts, but be sure you get the technical data package right and be sure you get a reliable product out of it because we will be building a lot of these things.

So the initial purchase is simply that. It is a tryout period to get the thing in shape to go on the street and let the manufacturers who know how to build this stuff compete with one another. I believe on that basis we have every reason to suppose we get these things for much less than the price per unit that we are paying now, which includes the technical data package and the reliability effort.

I think we should also keep in mind that if we are right, and I think we are, that we can get these things for $600,000 or so apiece, and we will be paying something like twice the cost of a comparable commercial product without armor and without all of the military provisions which are so necessary for battlefield action.

So I think in fact it is a good deal and a very good way to proceed to get maximum competition.

Senator GOLDWATER. General, do our allies, the British and Germans in particular, have tanks that will, as we say, dig in?

General OTIS. Senator, all nations advocate digging in of a vehicle when it is stopped in a defensive position, and when it can fight from cover. Each nation has different ways of accomplishing that. Some put blades on tanks, and some use earthmoving equipment separately, but all doctrine calls for taking a defilade position whenever possible so the smallest part of the target is visible.

Senator GOLDWATER. Thank you.

TRUCK SUPPORT FOR TANK BATTALION

General OTIS. I would now like to address another subject which has received a great deal of recent media coverage. This centers around the number of trucks required to support the fielding of an M1 tank battalion.

As part of the Army's modernization program, we are changing tank battalion organization from our current one to organizations tailored to modern equipment and tactical doctrine.

When an M60-equipped, modern battalion transitions to the M1, five additional 5-ton fuel trucks and trailers are authorized because of increased M1 fuel usage. It is certainly true that the M1 uses more fuel than the M60. The M1 weighs 5 percent more—3 tons—than the M60, and the M1 has a 1,500-horsepower engine as compared with a 750-horsepower engine in the M60. This allows the M1 to accelerate much more quickly and travel significantly faster on highways or cross country than the M60. Of course, this requires more fuel. There is no free lunch.

Also, four additional 5-ton ammunition trucks and trailers are authorized to increase the ammunition-carrying capacity.

So, a total of 9 additional trucks are necessary to support a modern battalion equipped with 58 M1's rather than 58 M60 tanks. This is a reasonable price to pay for the upgrading of the tank's capability.

Mr. Chairman, in these past few minutes I have tried to summarize the Army's M1 tank program in a context that I hope will be helpful to the subcommittee.

To summarize, we recognize the Abrams is not a flawless tank, and we have had a number of problems to overcome to get it into the field.

On the other hand, we believe it is the best tank in the world, one in which the soldiers who operate it have great confidence and one that will keep them alive on the battlefield as they go about their business of being prepared to defeat our potential enemies.

The M1 Abrams is a tank with a potential to increase its capabilities. The tank is not only the best in the world, but with changes in armament and other product improvements the M1 will continue to be a match for enemy tanks in the future.

We need your support for fielding the M1 rapidly and for continuing our program of modernizing the M60 fleet.

I will be followed by Major General Ball who will give you a status report since last year's budget hearings, and explain how this year's funding request will be used.

Senator GOLDWATER. Let me ask one or two quick questions.

You have acknowledged that we know that power train problems exist, and that testing of the modified transmissions will not be completed for nearly a year.

What justification can you give for proceeding with production given the uncertainty of durability of the transmission?

General ORIS. I would like to first ask General Ball to discuss what we are doing about that.

General BALL. Senator Goldwater, I would like to address first the transmission. If you are familiar with the background of the problems, we found we had a high failure rate when we exercised certain operational modes like pulling into position or shifting into reverse before the vehicle had come to a stop.

The gunners found they could even gage the target before the vehicle came to a stop, so the driver would shift into reverse with the engine revved up and the vehicle still moving forward, possibly 5 or 6 miles an hour. This we hadn't done with other tanks because

we hadn't the capability, but it was an evolutionary finding by the crews.

We found the transmissions couldn't stand the stress caused by shifting while moving. We applied a bit of analysis on that and applied a correction that put in a shift inhibit so if the vehicle is moving too fast, above 3 miles an hour, it inhibits the shift until the vehicle slows down. If the engine is revved up above 2,000 r/min, there is an inhibit to the transmission.

We took this back to Fort Hood and did as exhaustive a test as we could, far greater than we could imagine in combat and found we had no failures. We are confident that the failure mode that raised the uncertainty with the transmission in the test last year has been corrected. The design corrections are in production, and we are well on the way to retrofitting already fielded tanks to bring them up to the correct transmission standard.

Senator GOLDWATER. Is your testing going on now?

Secretary AMBROSE. It is laboratory testing and durability testing, with testing in the fleet starting in May.

General BALL. If I could move to the engines, we have not yet demonstrated the fixes in the field required to provide the durability required on the engine. Those have been slower in coming, and we have laboratory testing ongoing. We have only about 20,000 miles of vehicle testing with the design changes to the engine.

We intend to incorporate modified production engines and transmissions in tanks and run a five-vehicle test, 6,000 miles per vehicle, starting in May, to demonstrate or establish for ourselves that the changes do in fact work.

Senator GOLDWATER. When will these tests end?

General BALL. They will end early in 1983. I am targeting those to end in the January and February timeframe of 1983, with final reports to be completed by about May of 1983.

Secretary AMBROSE. Three things ought to be kept in mind here.

First, the fixes that were identified as being required have been introduced into production engines and transmissions starting, I think, in March, so that ongoing engines will include these fixes.

Responsible engineering judgment and laboratory testing confirms that those fixes should work.

The second thing is to get the answers that you want, as to whether the fixes work, you necessarily have to have production engines and then ongoing tests on those production engines. To do otherwise would not result in any confirmation.

But, finally, and most importantly, the durability that we are talking about is basically a question of how frequently you replace, or have to replace, or rework this engine. So it is not necessary for peacetime purposes to go back, or not absolutely necessary to go back through and retrofit.

It is a judgment call that will be made based on the relative costs of doing this. In wartime application, there is no problem. We are talking about an engine, transmission, and final drive combination which at its present demonstrated performance level will, 99 percent of the time, go through a battle day without any problem.

So it is basically the peacetime-life-cycle cost that we are looking at.

Senator GOLDWATER. General Otis has finished the technical discussion. Before we get into the discussion by General Ball on this year's budget hearing, would either of you gentlemen care to ask any questions?

Senator LEVIN. Thank you. I do have some questions.

COMBAT RELIABILITY

First of all, about the overall combat reliability figure, we have read some figures that there are repairs needed every 30 miles in one report and every 43 miles in another report if my memory is correct. I gather that that is a figure for minor repairs which would not cause a breakdown of the tank.

The Army doesn't use that measure. It uses a different figure and that is called combat mission reliability. In this case the M1 should be required to operate on the average 320 miles without suffering a failure in a major component which would require significant maintenance or replacement.

Is that true that the Army's combat mission reliability figure is that the M1 should be able to operate 320 miles without that major replacement?

General OTIS. That is a correct figure. The requirement, Senator, was 320 miles between failure where the failure was defined as one that would stop it from its combat mission.

Senator LEVIN. That is the critical test I presume, and not the minor repair figure which might show whether or not something goes out on a gage which doesn't affect the tank's operations and has to be fixed to permit the tank to do its mission. It is whether or not there is a breakdown which would require the tank's mission to be scrubbed. That is a 320-mile average figure?

General OTIS. 320 miles, that is the requirement or standard.

Senator LEVIN. Does the GAO accept that as a reasonable requirement?

Mr. SHELEY. I think we would accept it as a reasonable requirement, Senator Levin. The 43-mile figure that you referred to has to do with essential maintenance which might not necessarily get to combat reliability, but would get to system reliability. It means somewhere along the line part of the tank is going to be down for something, but not necessarily affecting its overall combat capability.

In other words it can run and it can shoot and it may communicate.

Senator LEVIN. The overall combat capability is our primary interest. Does the GAO agree with that? I am trying to get us talking about the same terms here.

Mr. SHELEY. We would agree that the test of the tank as a fighting vehicle is its combat capability.

Senator LEVIN. And the standard of 320 miles is a fair standard?

Mr. SHELEY. It seems to be reasonable, and I think that is comparable to standards applied to tanks in the past.

Senator LEVIN. Has the tank met that standard?

Secretary AMBROSE. Yes.

Senator LEVIN. What is the standard that is met?

Secretary AMBROSE. 320 miles.

Senator LEVIN. What is the test result on that?

Secretary AMBROSE. The test result was given before you came in, it was 350.

Senator LEVIN. I am sorry if this is duplicating something. There has been a lot of different figures in the press and if I am duplicating something that has been said I apologize.

Secretary AMBROSE. If I could add one comment, the results that have been reported of 43 miles and that sort of thing, are gotten by dividing the mileage by all of the failures that occurred, some of which are trivial and some of which would reduce to an extent the performance of the tank. However, the judgment was that the tank would keep right on going and be an effective battlefield performer if you didn't fix those.

But I think it should also be noted that the results are obtained on six preproduction tanks and to extrapolate those results, even those completely trivial results, through the entire 7,000 production as though nothing would have been fixed in the meantime is the fundamental error in the use of such numbers.

So we think there will be improvement both in the total number of failures encountered per mile, as well as in the essential and battlefield requirements as we go along.

Senator LEVIN. My point was to see if we could get agreement between the GAO and Army as to whether or not in this combat mission reliability this tank has met its standard.

Mr. SHELEY. According to the test data, combat reliability has been met.

Senator LEVIN. The next question has to do with how the M1 runs in the field with our soldiers. Has the GAO met with our soldiers in the field to talk about how this tank works?

Mr. SHELEY. Yes; I visited the testing of ongoing operations at Fort Hood, and I rode in the tank.

Senator LEVIN. I mean with the troops?

Mr. SHELEY. I am getting to that. I went down and talked with the troops operating the tanks and also went to maintenance shops and talked to the people at that point.

Senator GOLDWATER. We are fortunate today in having two enlisted men who have actually been in the field with the tanks. Sergeants, would you care to say what you know about this?

General OTIS. Let me introduce if I may, Sergeant First Class Braggs from Fort Hood who commands an M1 tank platoon of four tanks and their crews including one himself, and Sergeant Osborne who commands a tank himself. You may wish to ask for their opinion.

Senator GOLDWATER. Would you like to ask some questions?

TANK FIELD EXPERIENCE

Senator LEVIN. I am going to ask about how the men feel.

Briefly, we could ask them what their experiences with the tank in the field have been. This is in your own words now.

Sergeant BRAGGS. My experience is in the M1 tank which I have been on for 15 months. We have had a few minor problems, but the tank is the finest machine I have ever been on, and compared to the M60, there is no comparison.

Senator LEVIN. Which is better? They are both made in my State.

Sergeant BRAGGS. The M1. The M1 is superior to the M60. If I had to go to combat, that is the only machine that I would like to go with. I can't say anything bad about it. You throw a track and get all dirty, but that is a tank. As far as performance, it is fine.

Sergeant OSBORNE. I concur, sir.

Senator GOLDWATER. How about maintenance? Do you find that maintaining the M1 is easier than maintaining the M60 or other tanks you have been associated with?

Sergeant OSBORNE. Sir, in my end of the house, as to any part of the maintenance, it is still a tank, sir.

Senator GOLDWATER. Is M1 easier to maintain than the other tanks you have been acquainted with?

Sergeant OSBORNE. I say again, turning a bolt is turning a bolt, and that is my end of the maintenance, sir.

Senator GOLDWATER. I have been in that tank and I used to be a ground officer, but it was too dangerous, so I went to the air. If I ever have to go to combat, I can't imagine a tank that is better to operate and fire, particularly that cannon.

Senator LEVIN. I think there are two different messages, one coming from the men in the field and you are not the first one, and General Kroesen, the U.S. Army Commander in Europe, said his men are actually reenlisting because the men were so pleased with the tank—people who hadn't planned to reenlist otherwise.

We get press reports it is a lemon. I think the earlier we can pin down the issues and satisfy the public one way or the other, the better off everybody is going to be.

Senator GOLDWATER. I want to thank you two gentlemen for being here. We wish you the very best of luck in your years ahead. Stay in the uniform.

Senator LEVIN. I wonder if I could ask this question about those reports on the drive train.

You say next January or February more tests will be complete. There is a lot of concern about this tank because of these wide varieties of reports: the report it breaks down every 43 miles, that it needs a bulldozer to put it to bed at night, et cetera.

On the other hand, you have testimonials that it is the greatest tank in the world. People are reenlisting because of it and the public is understandably confused. I think the Congress would want to get the information as quickly as possible.

Can those tests, or the analysis of those tests be speeded up so we get the drive train information before January or February? Can we get partial results?

Secretary AMBROSE. Surely, we will get you the results as fast as they come in.

Senator GOLDWATER. Do you want to comment on that, General Ball?

General BALL. I would like to make two comments, yes.

On partial results I would repeat we have tested two tanks with all of the engine fixes in them, and as I mentioned earlier we have very high confidence in the transmission fixes and we have had no repetition of the failure mode experienced earlier in the transmis-

sions to which we will also apply the modification, by retrofitting those in the field.

Concerning the engine fixes, if that is a good term, the design changes and incorporation of modified hardware, we have only two with significant mileage on them in a field test. We have about 20,000 miles accumulated with no repetition of the pattern of failures. We have a lot of laboratory hours and we are continuing to run laboratory tests. We will be starting next week on a 6,000-mile equivalent laboratory test on the engine with mods.

When we enter the testing in May we will be running five vehicles, and the total test is 6,000 miles. Certainly there will be emerging data as we go along and I can make that available to you.

Senator LEVIN. I think it would be useful to get this data as soon as it is available.

Senator GOLDWATER. We have already asked for it.

Senator LEVIN. And not wait until January of February?

Senator GOLDWATER. We will get it.

Secretary AMBROSE. Although this is the most carefully calibrated and monitored instrumented kind of test, a great deal of day-by-day evidence has been accumulating and we rely on that also. We are intensifying efforts to collect and assess and publish that information and you shall have it as soon as it is available.

Senator LEVIN. I have one additional question if I could, for General Maloney.

TURRETLESS TANK R. & D.

There are recent reports that the Army is embarking upon research and development and design of a radically new, turretless tank because of problems with M1 vulnerability and maintenance.

Can you tell us if that is true—that you are doing R. & D. on a new tank and if so whether it is connected to the problems we have had with the M1 or whether it is scheduled R. & D. on a new tank regardlesss of those problems?

General MALONEY. We are beginning the exploration of concepts for a next generation of tanks. No; it is not driven by dissatisfaction with the M1 in any way. It is a normal process through which any development of a future weapons system would go to determine what is a better way to do it downstream. We are talking 10, 15, or 20 years downstream from now.

It is certainly desirable to reduce the presented area on a tank. If you can dig it in and have no turret showing but just an elevated gun, you present a much reduced target to an enemy gunner and this is a concept being examined. Elevating this gun and having sensors of some kind to let the crew see what is on the other side of the mound in front of them would be essential, so television sensors might be an appropriate thing to examine.

These are concept evolutions, perfectly normal and not driven by dissatisfaction with the M1. We fully intend to prosecute the entire program of 7,058 M1 vehicles.

Secretary AMBROSE. Senator Goldwater was critical earlier that we go 20 years or more between fielding new models while the Russians just go on kerchunk, kerchunk every 5 years. I am critical of the same thing. We are behind in doing these things. We should

always have a tank in production with a block of improvements scheduled to come along, and a new tank on the drawing boards and thinking beyond that as to what the future might bring, or we will be caught short in the future as we have been here in not keeping up with these things.

Senator GOLDWATER. That is one of the things that the Soviets have done. We have to admire them for that. I have referred to their aircraft. They started with a MIG-15 and they are now up to about MIG-28. They have different names on them now, but about every 2 years they bring on a new version of an old successful airplane.

We move slowly, and it has been almot 20 years since we built the fighter that we have been depending upon. We have grandsons now flying the B-52, that their grandfathers flew. I think the B-52 flew with General Custer, but I am not sure.

Secretary AMBROSE. We have a lot of our programs in the same fix, and we go along much too long with them.

Senator GOLDWATER. I have to leave, gentlemen. I have another engagement but I want to thank all of you. Your explanations have been very, very good, and I think that they can be clearly understood by the public.

General Ball, I am going to ask unamious consent that your prepared statement be inserted in the hearing record following the testimony today. Each member will then have an opportunity to read it.

[See prepared statement by General Ball, p. 2370.]

Senator HUMPHREY [presiding]. I want to talk about procurement. Let me start with the GAO representation.

Mr. Sheley, in general what are the GAO's findings with regard to savings involved in second-sourcing procurement?

Mr. SHELEY. Well second-sourcing will produce savings, but you have to use that second-sourcing when you have a large enough volume of procurement. It would be rather ridiculous to go second-sourcing on the B-1 bomber, for example.

On 7,058 tanks, possibly not at the prime level, but certainly at the sub-level, it would be very feasible, and also it will introduce a certain level of competition in the process which we would hope would keep the cost down some.

Senator HUMPHREY. Is it the element of competition and the subsequent holding down of prices and costs which is attractive in addition to the redundancy of sources?

Mr. SHELEY. Yes.

Senator HUMPHREY. Has the GAO ever made any recommendations to the Army regarding second-sourcing of M1 components?

Mr. SHELEY. Not with regard to the M components, we have not.

Senator HUMPHREY. Secretary Ambrose, what are your feelings about second-sourcing? Does it represent a potential cost saving?

Secretary AMBROSE. Second-sourcing is an effective way of cost saving, as Mr. Sheley said, provided it is done at the proper time and with due regard to the total of the cost of tooling up and things of that sort.

I look at this situation, and you have to look first at the prime contractor of the tank as a whole unit. We have two plants, both Government-owned and both Government-facilitized. They are run

by the same organization. For whatever reasons in past times these two plants were so arranged that they are fairly well interlocked.

Some parts are produced in each plant, and the assemblies are produced in both plants. We have started to take a look at whether we can take those two plants apart in a way that will allow them to compete, at least as plants.

We have not gone so far as to conclude whether that is financially sensible at this time.

We will have to see how this turns out, but such a look is being taken, and it would be quite some years before this could be accomplished, given the events that have already taken place.

At the major subcontract levels, on the one hand we have the engine. The engine is a production pacing item needed to reach full capacity. We have active study going as to how we can increase the capacity either by second-sourcing or by second-plant activities.

We don't have a conclusion, but we will have one pretty soon.

The fire control equipment is planned for a breakout I believe next year.

Senator HUMPHREY. In what year?

Secretary AMBROSE. The fifth production year buy. That is 1 year from now and the competition for that is already heating up. The transmission requires a heavy facility investment. It seems to be efficiently run and we have not at this time got a look going to see if there should be another source.

Most of the other components so far are not subject to a second-sourcing action. I will stand corrected, if I have forgotten something, by General Ball.

Senator HUMPHREY. I take it that your guidance is going to be that you will resort to second-sourcing wherever it makes sense and as early as possible?

Secretary AMBROSE. Yes, but again the effectiveness of it has to take into account the tooling costs, the possibility that you will idle capacity you have already paid for and things of that sort.

Senator HUMPHREY. With regard to the M1, I believe it was sometime last year the Department put out a presolicitation release for a number of components, the laser range finder, the commander's station, the ballistic computer, the gunner's auxiliary sight, the line of sight data link, and the thermal imaging system.

It would seem to indicate that the Army at some time conducted studies which indicated that second-sourcing was feasible. Yet nothing ever came of that. Why is that?

Secretary AMBROSE. I will speak to the thermal business and ask General Ball to pick up the rest of it.

THERMAL IMAGING DEVICES

The thermal imaging devices have been a bottleneck for many systems, not just the tank. I have taken a personal interest and active part in trying to determine what the Government should do to insure first an adequate capacity for all of its programs, and second, an effective availability of parts at a competitive price. I am doing that work at the moment.

I have visited all of the existing producers of these devices and those who are potential producers. I expect to have a recommendation to the Army by the end of this month.

The Army has been, as you probably are aware, the lead organization for the Department of Defense, so this is encompassing all DOD's activities. That, I think, will produce the answer as to which way to go in making those available for not just this program, but for the attack helicopter, some of the space programs and so on.

I will let General Ball respond to the other items you asked about.

Senator HUMPHREY. All right.

General BALL. Senator Humphrey, you are correct, we have done an analysis and estimated what our cost savings would be across the life of the program if we went second source. We continue with that, and we are developing the solicitation and request for proposals, and at the same time we have an expression of interest from a contractor in a multiyear procurement.

I have a commitment or promise of a fixed-price proposal as to what the fire control would cost on the multiyear procurement basis, and I want to analyze both approaches.

That is, our assessment of what could be saved on a second-source and assessment of where we stand in the status of the data package for production, and also the fixed-price proposal for multiyear procurement.

We will assess or make our decision based on which seems to be the most advantageous course for the program and the Army, all of these factors considered.

Senator HUMPHREY. Which components are you talking about?

General BALL. These are such as the line of sight unit and the computer, the thermal imaging system. I would extract the laser rangefinder from that list. We have extracted that from consideration for second sources because we have under development the night visual laboratory's CO-2 laser ranger finder, which, if it works out as we anticipate, and we expect it to, we would hope to put in as a part of our planned improvement, giving us a capability to lase through smoke which the current rangefinder will not do.

Secretary AMBROSE. I think the answer generally to your question of why nothing has been done about it is between the efforts of the program manager and all of the others trying to get the production up to speed, and the concern as to whether the product was stable or not, they just simply felt it was premature last year to introduce second source on top of all of the other management problems.

Senator HUMPHREY. You mean with regard to the tank itself?

Secretary AMBROSE. The components.

Senator HUMPHREY. You have been pretty busy?

Secretary AMBROSE. And we still are.

Senator HUMPHREY. Would you explain again with regard to the fire control package? You extracted the thermal imaging system on which you will have a recommendation by the end of the month?

Secretary AMBROSE. Yes.

Senator HUMPHREY. And also the laser rangefinder because apparently you think that you have got a better mousetrap?

Secretary AMBROSE. Yes.

Senator HUMPHREY. That leaves the other elements of the system, the commander weapons sight and the auxiliary sight and the line of sight data link. Where does all of that stand now?

General BALL. Sir, the command which manages it is Rock Island and they have the data packages and they are getting the information from those prior to making the decision about a request for a proposal.

Secretary AMBROSE. We owe you an answer as to when they will be finished and we will get it to you.

Senator HUMPHREY. Will you give us a rough idea?

Secretary AMBROSE. I don't have one for you at this moment, but for the record I will get it.

[The information follows:]

The Army is examining fire control procurement techniques with the goals of either developing second sources or entering into multi-year contracts. The plan is to select the option that will offer the greater cost savings.

We expect this examination to be complete by about May 1 1982. If the decision is to develop second sources, the Requests for Proposal (RFP) will be released in May with contract award in early fiscal year 1983.

Senator HUMPHREY. Rock Island is evaluating whether to issue a request for proposals, is that right?

General BALL. Yes.

Senator HUMPHREY. Is that something that ordinarily follows the presolicitation release?

General BALL. Yes.

Senator HUMPHREY. When were these releases, presolicitation releases published on the fire control system and the other components?

General BALL. I am sorry, I don't have the date at hand.

Senator HUMPHREY. What is the normal period of time between publication of the releases and the issue of the request for proposal?

General BALL. This period of time can be almost anything.

Senator HUMPHREY. They were published with a response date of October 16, and I don't know what the publication date was.

General BALL. With this sort of activity, it is to ascertain industry interest and feasibility of production. The result of such solicitations can be anything from "Forget it" and "Don't do it at all", to an active preparation and RFP based on the information.

I am answering generally and the matter could go on for quite a long time depending upon the individual items.

Senator HUMPHREY. In the cases where interest has been expressed, how long does it generally take to generate these RFP's?

Secretary AMBROSE. I don't think there is a single answer, but let us give you a better answer for the specific items that you have asked about.

Senator HUMPHREY. My point is that given the immense cost of the M1, I would hope that your people would have the time now to press the issue of second-sourcing, so that we can bring down some of these costs just as quickly as possible.

Secretary AMBROSE. We have to find the time to do that, and we will find it.

Senator HUMPHREY. Well, I come back to the original puzzle here, which is why these releases were published in 1981. Appar-

ently, the idea was to incorporate second sourcing in the 1983 budget release.

Wouldn't that be the logical conclusion to reach, if the releases were published prior to October, that you were going to get into second sourcing in fiscal year 1983?

Secretary AMBROSE. I don't think that they are directly connected. That is a possibility, yes, but it was not done for that reason.

Senator HUMPHREY. Is there any reason to assume—if an RFP is being considered, that you have reached the conclusion that these components are being manufactured in such quantities as to warrant second sourcing?

Has that conclusion been reached?

General BALL. I would like to respond to that.

What we are coming to is the assessment, and it is not that the people have been idle in consideration of this activity, but recalling that in the first 2 years of production of this tank, the contract was structured in such terms that we had a single-systems integration contract; total responsibility for the configuration and control of the configuration of the tank was vested in the prime contractor.

We now have a technical data package, but in the review of the technical data package, both for completeness and technical accuracy, and, of course, to see whether we have proprietary items in there that might be a hindrance to a second source, all requires a great deal of review. That is ongoing.

SECOND SOURCE PRODUCTION

Potential second-source producers are aware of this, and they were invited to, and a number did, in fact, attend a presolicitation conference held in Rock Island on February 3 and 4.

There is a great deal of dialog going with those contractors and there is a great deal of work in the review update of the technical data package to be sure that it is adequate for another contractor to take and produce acceptable fire control equipment from those data.

Senator HUMPHREY. What was that last point?

General BALL. February 3 and 4 was the presolicitation conference.

Senator HUMPHREY. And you said something else?

General BALL. Whether or not a second-source contractor could take the data available and produce an acceptable set of equipment for us.

Secretary AMBROSE. If I could go back to the thermal imaging situation, the M1 is getting marginally adequate delivery of these equipments by virtue of the fact it has a DX priority. Going out on a second-source basis might just have the sources competing one with the other for this short set of parts. That is why we had to figure out where the parts would come from before it would make any sense, in our opinion, to go after a second source for the equipment.

Senator HUMPHREY. Could that have been a problem in the fire control system or are you using it as a general example?

Secretary AMBROSE. It has been a problem generally on these infrared things.

Senator HUMPHREY. What about the matter as to whether or not there is proprietary technology involved? Is that the case with the fire control system?

General BALL. Sir, I could not address specific items as to whether or not there is. That is most commonly the case, that we run into preparatory issues that have to be resolved and also process questions that have to be resolved.

Senator HUMPHREY. With regard to the thermal sight, one contractor has alleged that proprietary technology is involved. My information is to the contrary and if that is a problem I would like to have an opportunity to discuss that with you, General Ball.

Where does that leave us?

Obviously second sourcing is desirable. We need more of it. A high percentage of defense procurement is not subject to second sourcing.

Certainly, we ought to be striving for second sourcing given the outstanding history of that policy, and striving to second sourcing just as frequently as we can.

Apparently the fire control system may qualify for second sourcing. The Army is considering second sourcing and requests for proposals may be issued within a matter of weeks.

General BALL. A decision as to whether we will go or proceed will be made within a matter of weeks.

Senator HUMPHREY. Will these be one decision for systems or will there be a separate decision for each of those elements?

General BALL. Yes, sir, each element will be considered in the configuration of a package that would be deemed feasible for second-source solicitation.

Senator HUMPHREY. One last thing, then, General Ball.

Will you have someone on your staff notify me as soon as the decision has been made? That will be within a matter of weeks? If the decision is affirmative, how long will it take to issue RFP's?

General BALL. Sir, the work in preparation normally is in fact processing, that could be done very quickly after the decision, since the notification has been made. There is no waiting time.

The time, I cannot address the specific time that we would set in that as the kind of information we would require, but our plans, as you are probably aware, are to procure an insurance bid in the first year of second sourcing, an educational bid we call it, which allows a second-source contractor to build up his production capability, and the learn-how period, and above and beyond requirements to support production in that year and then continue on an actual shared production basis in the year following.

Senator HUMPHREY. Assuming that you decide to go ahead with second sourcing, you reach a decision within a few weeks and shortly thereafter you issue the RFP's, why can this not be incorporated in the 1983 budget, and why can't we get an early start on it?

General BALL. Sir, we don't anticipate we would be able to bring a second source on in that time period, to deliver products against the 1983 budget. We have funds to do the facilitization and development effort in that budget and as far as procurement of components, they could not deliver in that period.

Senator HUMPHREY. You have anticipated reaching a decision, being able to facilitate production?

General BALL. That is correct.

Senator HUMPHREY. Secretary Ambrose, is there a study that compares the M1 with the M60? Either a GAO or Army study?

Secretary AMBROSE. There are all sorts of comparisons that have been made, and I will let the GAO speak for itself. They have conducted more studies than we have. We have not done an explicit head-to-head competitive kind of study.

Some data has been presented here and in other ways.

Senator HUMPHREY. There are no overall studies but there are comparative studies of different aspects?

Secretary AMBROSE. The sum of all of these comparisons that have been made over time is that the M1 is a vastly superior product.

Mr. SHELEY. In the early testing programs there was a runoff between some M60 tanks and M1 tanks, but they were preproduction type models, and will in all respects except one, the M1 as I recall it, outdo the M60. The one failing area was in the reliability. As far as other performance factors, the M1 far exceeded the M60, but that test was very early on. I don't believe it has been repeated. General Ball will have to answer that.

Secretary AMBROSE. I believe Mr. Sheley would agree, comparing one product with another one.

Senator HUMPHREY. What about a study that compares the M1 with the M60A3?

M1–M60A3 COMPARISON

Secretary AMBROSE. On the whole we have been talking about the A3 version.

Mr. SHELEY. The study I referred to was the A3 and it was right off the production line tanks, as I recall, in that test, the field test.

Senator HUMPHREY. When the Army compares the M1 with the M60, are you talking about the M60 or the M60A3?

Secretary AMBROSE. The M60A3. As you know, the fire control systems are not that far apart. They contain in many respects features that have equivalent performance and I mention that because you were referring to fire control. But the comparison overall includes agility and survivability and things of that sort.

Senator HUMPHREY. Senator Levin earlier brought out the regrettable fact that the American people have been misinformed by a number of press accounts critical of the M1 tank.

I want to ask you about a number of other accounts in addition to the one that Senator Levin discussed earlier.

What comments do you have to offer on the criticisms about the weight and the size of the M1 and the matter of soldiers being able to walk behind the tank?

Secretary AMBROSE. On the question of weight, it is a fact, the M60 weighs 57 tons and the M1 weighs between 60 and 62 tons. Most of the competing tanks, if you will, in the world, weigh within a few tons of that weight. There does not seem to be on the Western side a great deal of difference when comparing one tank to the other.

The business of walking behind the tank I find a little bit hard to imagine. Here is a tank that goes 45 miles an hour on the road and

30 miles an hour on a cross-country. I don't know how a soldier is going to keep up with that.

There has been some reference to the exit temperature of the engine, which is higher in fact than the diesel or equivalent diesel, equivalently positioned, and you wouldn't want to stand there. I have stood behind the tank at a distance of 5 or 6 feet and while it is not comfortable, it is not impossible either, but I don't believe there is a serious view that on the battlefield this tank will be going so slowly that the soldier can stay in its shelter a few feet behind it.

General Maloney, do you have any futher comment on that?

General MALONEY. Sir, there have been allegations in the press that say, for example, that the M1 is too heavy to cross European bridges, and as the Secretary says, it is in the same ballpark with other tanks. In fact, the German's is slightly heavier and slightly wider, and it was certainly designed to cross their own bridges.

It has been alleged that this is the largest tank in the world in the press. We looked at the various tanks in the NATO community and we asked, How big a box would you have to have to fit the tank inside. We find in fact the M1 would fit in a smaller box than our own M60, primarily due to its height, and the Israeli tank, the British Chieftain, and the LEO-2. There is not much difference among those tanks, but it certainly is not the biggest tank in the world.

There have been allegations this is the heaviest ever of U.S. tanks. That is not so because we had a few, years back, that were heavier than the M1.

There has been an allegation that was alluded to earlier concerning the hydraulic fluid, that the Israeli force, because of their experience in the 1973 war, now have switched to a less flammable fluid. In fact we all switched to a less flammable fluid as a result of the Israeli experience, but at this time, as was mentioned earlier, we use the same hydraulic fluid as they use in their new tank.

There have been several allegations in the press that the machinegun mount breaks off in the M1. Early in testing this happened on one instance and it has been fixed and it has not recurred.

There have been allegations that the ammunition doors are a safety hazard and again testing some 12 years ago showed that there was a safety hazard there and we had pinched fingers on one occasion. The doors were modified and the doors now work and we do not have that problem any more.

Incidentally, the doors are there to compartment the ammunition away from the crew so that in the event the tank is penetrated where the ammunition is, the ammunition blows upward and the crew survives.

The allegation about walking behind the tank has been covered.

There has been an allegation that we should have paid more attention to machinegun cover range and the machinegun is a very important secondary armament. It is a very important secondary armament and we did on the M1 pay close attention to it.

The allegation says that the caliber .50 machinegun cannot fire low to the left, and it is interfered with by another hatch and another assemblage on the left. That is true. The assemblage on the

left is in fact another 7.62 machinegun. There is one more machinegun on this tank than there is on the M60. The cover range is excellent, and as was mentioned by the Project Manager earlier, this tank carries twice the machinegun ammunition than the M60 does. So, certainly we are paying attention to that.

Secretary AMBROSE. I don't know how much of these things you would like to have mentioned, Senator, but there seems to have been an amaziang perpetuation of a relatively small number of early events in the testing of this device extrapolated into the future as though we weren't going to fix the things that were wrong. That is just not the purpose of testing in the first place.

Senator HUMPHREY. Are any of these difficulties still problematic?

Secretary AMBROSE. The commander's station is an argument within the service, between people who want to fight standing up and people who want to fight sitting down. Each side has some value to its argument. The argument has gone on too long. General Meyer and I decided a month or two ago that we had heard enough of that. I think we have heard quite a bit about durability and things of that sort.

You may not have been in the room when we talked about the track life. Track life is a problem, relative to the specification set years ago when nobody knew how to meet it. The track pads are no worse than the M60, but we still are looking for ways to improve them.

On the other hand, a specification like that is for peacetime purposes. There is no need for track that goes 2,000 miles in war. The tank will not go 2,000 miles in war.

These are life-cycle costs problems which also have other ways of getting around them. The Russians transport their tanks to the practice fields and so should we rather than wearing tracks out in peacetime running down autobahns. We are going to change that. These are kind of nonproblems, and it is an acknowledged problem of that sort. I just cannot account for the lack of balance and persistence in these kinds of reports.

Senator HUMPHREY. Before I close, does anyone have anything further they want to offer?

Very well. Thank you, gentlemen, for your testimony, and for your time, and we will leave the record open until 5 p.m. for the submission of information requested.

[The prepared statement of General Ball follows:]

PREPARED STATEMENT BY MAJ. GEN. DUARD D. BALL, PROGRAM MANAGER FOR ABRAMS TANK SYSTEM, U.S. ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND

Mr. Chairman, members of the committee, it is my pleasure to appear before you today and report on the status of the Army's main battle tank program. I will recapitulate some of the activities which have been discussed in previous testimony and provide detailed information concerning our progress over the past year. With you permission, I will insert my formal statement into the record, present you with a brief program overview and answer any questions you may have.

PROGRAM OBJECTIVE

In 1972, the Army and the Congress of the United States charted the course of the Army's main battle tank program. The program objective was to develop and field a main battle tank capable of meeting the threat of the 1980's and beyond. The tank

had to achieve significant improvements over current U.S. Army tanks in the areas of crew and system survivability, firepower, mobility, and the logistics factors of reliability, maintainability, and durability. Our response to that challenge is the M1 Abrams tank, now fielded in the United States and Germany.

PRODUCTION AND FACILITIZATION

Production of the M1 Abrams tank has introduced a totally new concept in the manufacture of U.S. tanks at the modern Lima, Ohio production facility. While most predecessor tanks have been assembled from precast hulls and turrets, the M1 is totally fabricated from the ground up. The process starts with sheets of armor steel plate which are flame cut into required shapes and then welded to become hulls and turrets. Next, these fabricated structures are machined to specification followed by the installation of components and subcomponents. Finally, the hulls and turrets are married to form a complete tank which is tested, adjusted and retested as necessary to be acceptable to the government. The assimilation of the new techniques and full capitalization upon the potential efficiencies offered by the modern plant facilities have been somewhat slower than we had expected. This notwithstanding, you will see in this report that our production build up is progressing reasonably close to the plan presented last year and that our fiscal year 1981 production contract costs are approximately 18 percent less than projected at that time. The procurement objective is still 7058 tanks and the plan to establish a surge capacity of 150 per month remains unchanged.

ABRAMS PRODUCTION

Tank production rate, while slightly behind schedule, has improved markedly over the past year. We have accepted some risks in the interest of forcing production maturation and getting this urgently needed system into the field. I must emphasize here that we have insisted upon and achieved greatly improved quality at the same time. I believe the schedule projected is attainable with acceptable risks.

Over most of the past year, engine production has paced tank production and delivery; however, engine deliveries have improved recently. For the past four months, fabrication and assembly at the Lima Army tank plant have paced deliveries. There are some risks to production; Chrysler, soon General Dynamics, and AVCO are well aware of the continued attention needed in these areas. The production base for other components has progressed well and seems to be fully adequate to support the production schedule; but, I anticipate a continuing need for intensive management of engine production and tank fabrication and assembly through the balance of this year. We will do this, of course. At the same time, we will continue our aggressive drive to improve quality, production efficiency and schedule performance.

In light of AVCO's current position, we are evaluating the AVCO potential for overall improvement through an Army-sponsored industrial productivity improvement program (similar to the Air Force's technology modernization program). We are also considering second sourcing of the turbine engine to broaden our production base.

The first two tanks assembled at the Detroit Arsenal Tank Plant will be delivered on schedule this month. Preparations are progressing as planned for production growth to 30 tanks per month in January 1983.

Present production capacity is 60 units per month with some multi-shifting required. Efforts are being directed toward increasing that capacity to 150 per month on a multi-shifting basis, with an interim goal of 90 per month. Funding is adequate to meet both goals. Facilitization costs have exceeded our original estimates, due in great part to higher than anticipated inflation in the economy. Further adverse impacts have resulted from variations in actual machine time versus those planned, identification of additional machine requirements and a greater than anticipated number of engineering changes. This growth has been funded through additional moneys provided in the fiscal year 1981 and fiscal year 1982 budgets and savings realized in other vehicle costs.

We have revised our facilitization management system to provide better control and will continue to manage nonrecurring facilization costs intensively to insure that goals are achieved at the least possible cost.

TESTING

We have conducted an extensive program of test and evaluation of initial production vehicles. Since March 1980, 82,300 miles and 18,400 main gun rounds have been

accumulated on LRIP test vehicles. The mileage on all LRIP vehicles is now in excess of 100,000 miles.

The Army's third developmental test (DT III) conducted by the U.S. Army test and evaluation command (TECOM) is essentially complete. Results are being evaluated independently by the U.S. Army Materiel Systems Analysis Agency (AMSAA). The test was designed to evaluate the automotive aspects of the tank; its weapons and fire control; environmental effects; and reliability, maintainability and durability. The objectives were to determine if: The problems discovered in earlier testing on pre-production tanks were corrected; the system met U.S. Army requirements and contract specifications; the system support package is adequate to support the tank in the field; the system is capable of operating in various climatic environments; and the M1's RAM-D requirements could be met.

The operational test (OT III) of the M1 tank was a two site test conducted by the U.S. Army Armor and Engineer Board at Fort Knox, Ky. and the U.S. Army Training and Doctrine Command combined arms test activity at Fort Hood, Tex. Both tests were managed and independently evaluated by the Operational Test and Evaluation Agency. The objectives of the tests were to: Determine if the production model M1 incorporates, without degradation, the improvements made to the pilot model M1; evaluate the adequacy of institutional training programs for tank crews and maintenance personnel; provide the data with which to assess the logistics supportability in battalion and smaller units; and to assess system RAM-D performance of production tanks.

Both operational tests began in September 1980 and ended in May 1981. At Fort Knox, a 14,026 mile and 2,800 round operational mission profile test of four production vehicles was run. These test data, in conjunction with development test results, provide a total RAM-D assessment data base of 32,000 miles and more than 6,400 main gun rounds. This test also was used to evaluate the crew's ability to employ the tank tactically.

OT III was conducted at Fort Hood with M1 LRIP vehicles in a three company battalion. One additional vehicle was issued to the test units as an operational readiness float. The first company achieved initial operational capability (IOC) on January 15, 1981. The test included crew and small unit maneuver exercises, individual tank and platoon gunnery and company and battalion level field training exercises conducted under varying operational and environmental conditions day and night.

TEST RESULTS

User priorities.—(1) Crew survivability; (2) hit probability; (3) time to hit/kill; (4) agility; (5) X-country mobility/range; (6) complementary weapons; (7) system integration; (8) equipment survivability; (9) physical dimensions; (10) signature reduction; (11) log spt, tmde, spt-eqpt.

The user has prioritized the operational characteristics for the development of the M1 tank in the order shown on this viewgraph. The current test results show the system to be meeting or exceeding most specific requirements within these 11 categories. Crew survivability, the top priority characteristic of the M1, has had the single greatest influence on design of the tank. The revolutionary protection system combines armor of special design, compartmentalization of fuel and ammunition, high mobility and agility, automatiac fire detection and suppression and two onboard smoke generating systems. The effectiveness of these survivability techniques has been demonstrated conclusively. Ballistic evaluations of production model hulls and turrets have demonstrated that the transition from R. & D. to production was accomplished without degradation to any ballistic performance parameters and that the quality is being sustained. These structures have been subjected to attack by a large number of representative threat munitions to include small arms, large caliber anti-tank rounds and anti-tank mines. Throughout the test, the system performed to specification, meeting the MN requirement. We can state unequivocally that the M1 provides the U.S. soldier with a tank of unprecedented protection and survivability.

Superior firepower performance has been demonstrated in production vehicles and provides the tank with significantly improved offensive capability that should remain competitive throughout the remainder of this century. Enhanced performance has been attained through the use of a digital computer based fire control subsystem that features stabilization of the sight and weapon, a laser range finder and a thermal imaging system for use during periods of reduced visability. The most significant fire control advancement is the ability to engage and hit targets while moving cross country at relatively high speeds. This is attributed to the gun/turret

stabilization system and the advanced torsion bar suspension system which greatly dampens hull input and disturbances.

The M1's high horsepower to weight ratio (25 HP/ton) provided by the turbine engine and its high performance suspension system result in mobility performance unsurpassed in its weight class making for an extremely agile tank. The tank is capable of rapid, sustained cross country operation and is far superior to the current U.S. main battle tank as shown below:

	M1	M60
Acceleration (0-20 m.p.h)	[1] 5.8	[1] 14
Speeds (M.P.H)		
Maximum	45	32
10-Percent slope	26	11
60-Percent slope	5	1
Cross country	30	15

[1] In seconds.

Early test results indicated a shortfall in cruising range and vehicle weight. DT III Testing reflected a cruising range of 225 miles against a requirement of 257 miles at a speed of 25 miles per hour, however, at speeds of 28-30 miles per hour, the M1 exceeded the requirement. This was accepted by the user as meeting or exceeding the requirement.

Early production vehicles exceeded the 60 ton combat weight limit, however, a sampling of second year production vehicles revealed an average weight of 59.8 tons, as opposed to the 60.1 ton average for the first year production.

TEST RESULTS—FAVORABLE

Survivability.—Actual firings demonstrated armor met or exceeded requirements.

Firepower.—Excellent, especially demonstrated firing on the move capability.

Mobility/agility.—Superb, important key to battlefield survivability.

Reliability.—Assessed to exceed both combat and system reliability requirements.

Troop acceptance.—Troop reception and confidence in M1 has been outstanding. Unit esprit de corps increased following M1 reception.

In summary, the M1 Tank has excelled in those operational characterisitcs of key importance to the user.

RAM-D PARAMETERS/STATUS

PARAMETER		REQUIREMENT	STATUS
COMBAT RELIABILITY		320 MMBF	350
SYSTEM RELIABILITY		101 MMBF	126
SCHEDULED MAINTENANCE,			
DAILY		.75 CLOCK HRS/3 MHS	.6/2.55
AT 1500 MILES		36 CLOCK HRS/ 64 MHS	23.6/37.6
UNSCHEDULED MAINTENANCE			
ORGANIZATIONAL 90 PERCENT	<	4 CLOCK HRS/8 MHS	3.3/5.9
DIRECT SUPPORT 90 PERCENT	<	12 CLOCK HRS/22 MHS	11.2/19
MAINTENANCE RATIO		1.25 MAN HR/OPER HR	1.34
VEHICLE LIFE		6000 MILES	6000 +
POWERTRAIN DURABILITY,		.5/4000 MILES	.37
PRIMARY WEAPON LIFE		1000 ROUNDS	1000
TRACK LIFE		2000 MILES	1056
ROAD/IDLER WHEEL DURABILITY	<	20 PERCENT IN 3000 MI	OK

The DT/OT III tests are essentially completed; however, the final results have not been evaluated by the official Army RAM-D assessment conference. The chart shown here reflects status at the time of the last update in July 1981. Final assessment of test data will not be completed until late this month. The PMO evaluation is that all factors will be essentially the same as shown here except for a reduction in maintenance ratio. Thus, it appears that we have a shortfall in only two parameters. All other parameters appear to have been met.

Track life is limited by state-of-the-art rubber compound technology. While we are pursuing development programs to improve performance, we do not expect more than 10 to 20 percent improvement in the near term.

POWERTRAIN DURABILITY

REQUIREMENT: .5 PROBABILITY OF 4000 MILES W/O REPLACEMENT

TEST: 7 EARLY PRODUCTION VEHICLES - 35,242 MI (SCORED)

RESULTS	POINT ESTIMATE	80% CONFIDENCE BAND
REQUIRED	.5/4000	3307<MMBDF<8875
DEMONSTRATED; (PMO ESTIMATE)	.38/4000	2590<MMBDF<6049
* FORECAST:	.62/4000	4271<MMBDF<13,685

* BLUE RIBBON PANEL FORECAST FOR TANKS PRODUCED AFTER MARCH 82

The major limitation on power train durability is the engine. Earlier problems related to quality control have been alleviated; however, some needed design changes were placed into production only last month. We plan a follow-on durability test commencing in May 1982 to demonstrate the effectiveness of these changes. An independent panel hs assessed these changes and concluded that engines incorporating the design and quality improvements should meet the requirements established.

The selection of a turbine engine for this tank has been the subject of much controversy. Understandably, the failure to date to meet the durability requirements established for the engine has prolonged the controversy and heightened concern. We believe, however, that the problems experienced have not inherent in the application of a turbine engine to a ground combat vehicle. Rather, they seem clearly to be a result of shortcomings in engineering, production control and quality assurance on the part of the producer. The results of our extensive efforts to bring about the needed improvements, while less than hoped, nonetheless have been substantial. With continued emphasis by the government and the contractor, we are confident the turbine engine will measure up to its exceptional potential. We intend to insure that emphasis is continued. notwithstanding the shortfalls in initial production engines as measured against the original requirements, it is significant that we are experiencing engine failures far less frequently than in diesel engined tank.

The Army has an ongoing program to increase RAM-D levels beyond those needed to meet the minimum mn requirements and then strive to achieve the upper limit goals established for the M1 tank. The approach has been to direct efforts toward three major categories; reliability, durability and maintainability. Our near term schedule concentrates on redesign of those selected components which offer the greatest payoff to improving RAM-D; reevaluation of configurations not previously pursued for design to cost considerations; and changes in the duty cycle for which a component was designed. Longer term aspects deal with development of design changes which may be required to correct problems which surface during DT/OP III but do not cause the tank to fall short of current requirements. These actions when combined with engine verification programs, correction of deficiency actions required by contract and continued maturation of the production process, should provide assurance that the M1 will exceed the RAM-D requirements and perform even better in the field.

SUPPORTABILITY

We have made a major effort over the past year to improve all elements of M1 supportability. No aspect of the program has received a greater priority or more managerial attention. I am pleased to report that the progress has been noteworthy. We have made a quantum advance in the quality and effectiveness of manuals and

test sets. The supply system was converted from the developmental system to the standard system on schedule with all assets transferred to the Darcom Readiness Commands and the Defense Logistics Agency in the first quarter of fiscal year 1982. Our spares and repair parts situation is better than projected last year; most items are now in stock. There are, however, about fifty critical items which continue to require intensive management.

The validation and verification of all of the operator level publications has been completed and these publications are now being printed and provided by the Adjutant General. Validation and verification of the remaining manuals is on schedule with completion projected for November 1982. Other organizational manuals are being validated and verified at Fort Knox. The Direct Support and General support maintenance publications are undergoing the same process at the U.S. Army Ordnance School. Under the skill and performance aids concept, M1 operator and maintenance training is integrated fully with the technical manuals. The task and skill analysis completed last year has been used by the training agencies as a basis for training development and improvement. The experience gained in net training at Fort Hood for OT III has resulted in significant improvements to both the Tradoc resident courses and the transfer of training knowledge to European net instructors. A new equipment training team has completed training instructors at the 7th Army Combined Arms Training Center (7th CATC). These 7th army instructors are just completing the new equipment training of the 1st battalion in Europe. The new equipment training team for Conus fielding is being staffed now in preparation for the fielding of the 2nd battalion at Fort Hood. All required Tradoc institutional training is ongoing to insure availability of trained replacements for M1 operational and support units.

The requirement for special tools and test equipment is closely associated with the M1 maintenance concept of modular replacement of components, ease of maintenance, and repair forward. Compared to other tank systems. The number of special tools has been reduced significantly. These tools, along with the semi-automatic field test sets needed for maintenance troubleshooting, have been delivered to the user.

Extensive use of training devices and simulators has been planned to reduce cost and improve both operator and maintenance efficiency—maintenance trainers developed by the Educational Computer Corporation have completed operational testing satisfactorily and are scheduled for fielding beginning in the second quarter of fiscal year 1983. The conduct of fire trainer (COFT) developed by General Electric has been tested with encouraging results. Negotiations are in process with contract award scheduled for July 1982. We hope to have the COFT in the field in 1984 to support institutional training at Fort Knox and sustainment training of tank gunners and commanders in tank battalions in the field. A drivers trainer has been tested also. Results are being evaluated; however, preliminary indications are that we may be able to accomplish the training objectives with a simpler, less costly device.

In general, we are optimistic of the payoff in the development and use of these simulators. Given the potential savings and proficiency enhancement they offer, their adoption seems imperative. We will continue our efforts to realize that potential.

Based on the program revision of fall 1980, which slipped the Army tank program distribution of M1s by six months, M1 fielding is on schedule. We have one M1 battalion on the ground in Conus and one in Europe. Tanks and support equipment for subsequent battalions are on track to support required deliveries. Complete packages, including special tools, test equipment, repair parts packages and training are given to the units at the same time the tanks are issued.

The net training base in Europe is on line and institutional training here in Conus is on schedule. Mechanics from the second European battalion are in training at 7th CATC. Training schedules have been coordinated and training support packages are being assembled for the second battalion at Fort Hood.

Bringing all of the program deliverables together in a fielding package will continue to challenge us in the coming year. Stocks on hand and on contract support the fielding schedule.

Field acceptance of the semi-automatic test equipment has been gratifying. The organizational test set, STE/M1, has been considerably improved based on DT/OT III experience. The 7th program update includes extensive engine troubleshooting capability which has been validated and proven to be effective. Direct support electrical system test sets continue to perform outstandingly. The thermal imaging system test set, a hot mockup, is doing well in its interim role. Quantities are adequate to support the fielded units until the end of 1982 when the first production

deliveries of the thermal system test set will be received. Ongoing programs assure that effective soldier-software-hardware interface is sustained.

Much remains to be done, of course. This year we will see no relaxation of our full court press on supportability. We have a formidable challenge in assuring that repair parts continue to flow as necessary to support the increased densities of tanks in the field. We must complete the in-depth analysis and corrective action program begun in February 1981 to perfect our test sets and the troubleshooting routines. We will field the thermal system test set in the first quarter of fiscal year 1983. While every effort is being made to learn from our experience with the STE/M1, it is inevitable that we will have some growing pains with that new system. Preparations for transfer of depot support from contractor to government depots is on schedule—and ahead in some areas. Total transfer will not be complete until 1984, however. In the meantime, the responsiveness of our contractor depot support must be improved. Throughout, we will endeavor to incorporate experience gained into system improvements as quickly as possible.

In summary, the support system is in better shape than projected for this point in our assessment of a year ago. We have confidence in further improvements and maturation in the year ahead.

MANAGEMENT REVIEWS

As I reported to you last spring, a special ASARC convened on 17 February 1981 to decide on a management plan to support third year tank production and fourth year advance procurement actions. The system was judged to have met virtually all requirements and was classified as a standard Army item officially becoming the M1 Abrams tank. Further, a decision was made to continue production at 30 tanks per month while preserving an option to ramp up to 60 tanks per month as planned earlier. An Army fielding readiness review was conducted in July 1981 followed by a DA SIPR in August 1981 in which the decision was made to proceed with fielding. On 15 September 1981, the DDR&E and DSARC principals reviewed the program status and approved production at rates above 30 per month.

105MM AMMUNITION PROGRAM

During the past year, significant advances have been made in our efforts to improve 105mm tank ammunition. We scaled up production of the M774, the Army's first depleted uranium penetrator tank round which was fielded in May 1981. In addition, we are completing the development of the XM833, the high technology follow-on to the M774. We plan to field the XM833 late in 1983. The XM815, the future chemical energy half of the Army's family of 105mm tank annunition, is in the validation phase of development. The XM797 kinetic energy training round with a range limiting capability that allows its use on shorter tank ranges, experienced development problems. We have developed a revised breakup mechanism and plan to re-enter validation.

1,000 HOUR DURABILITY TESTS

An AGT 1500 turbine engine underwent 1,000 hours of durability testing from 15 June 1981 through 22 September 1981. In accordance with the DOD blue ribbon panel recommendations, the objectives of the test were as follows: Verify the production methodology, tooling and quality control; indentify areas of improvement; and validate items previously identified as requiring improvements in reliability and durability.

The 1,000 hour durability test is equivalent to 18,000 miles of turbine engine operation. The engine completed a total test time of 1,102 hours which includes "run-in" and calibrations. There was a total of 1,662 total engine starts. The test verified the design maturity of the majority of the engine components. However, problems were encountered during the test which, upon investigation, revealed the need for additional improvement. Specifically, problems were noted in the area of the reduction gearbox and the power turbine support bearing assembly. Upon teardown of the engine, it was also found that the combustor system exhibited some evidence of erosion and cracking. An aggressive investigation is underway to resolve the reduction gearbox problems using both rig and full engine tests. The power turbine support bearing problem and the combustor problem are being addressed under the engine RAM-D growth program, since they met minimum specified requirements.

Two AGT 1500 engines will undergo 6,000 mile equivalent laboratory mission profile testing to validate design changes in the reduction gearbox and in the accessory gearbox drive train. A follow-on 1,000 hour test is planned for the July/August 1982

time frame. This engine will include the above design changes and other available improvements that will be reflected in the configuration of third year production engines.

ALTERNATE ENGINE PROGRAM

The Army was directed to plan an alternate tank engine program to hedge against possible performance shortcomings with the AGT 1500 turbine. In fiscal year 1976, the AVCR 1360 engine developed by Teledyne Continental underwent DT I tests in General Motors diesel XM1. GM proposed design changes prior to DT/OT II. During fiscal year 1979, $3 million was added to the Army budget to continue development of AVCR 1360 to develop variable area turbochargers, variable speed cooling fans and study compatibility with production M1 chassis design. In fiscal year 1980, $14.2 million was added to the Army budget to continue development of AVCR 1360 to rebuild two engines for conducting laboratory tests, build two new engines for vehicle tests, modify two XM1 prototypes to accommodate AVCR 1360 and conduct vehicle tests.

The 1,000 hour lab test was terminated after 218 hours on 14 September 1981 due to 51 incidents including variable area turbocharger failures, fuel injection pump failure, variable fan speed control unit and supercharger drive failure. Post test inspection revealed piston carbon build-up, loose cylinder hold down bolts and crankcase cracks at main bearing cap studs. The 1,000 hour test is scheduled to start in March 1982 with 500 hours of development completed prior to this test. Corrective action has been applied to address the failure modes that appeared during the first test. the 400 hour NATO test scheduled to demonstrated corrective actions has been dropped due to funding constraints imposed by the conduct of the additional development tests. Vehicle rework has continued on schedule with a 6,000 mile test to be run at Aberdeen proving ground between July 1982 and April 1983. A second vehicle will undergo performance and durability tests at Yuma proving ground during the July to December 1982 time period.

Tacom has estimated the program costs will require an investment of over $300 million and 40 months to bring the engine to production.

STANDARDIZATION ACTIVITIES

The M1 program continues to be involved actively with our NATO allies and other friendly nations in areas of rationalization, standardization and interoperability. Cooperation with Germany continues with the 120mm tank main gun system and with several items under the M1-Leopard 2 harmonization memorandum of understanding. Germany has also expressed interest in proposed M1 product improvements, such as the CO2 laser range finder, fire suppression system and bussbar system for the batteries. During the past year the U.S. and Germany conducted detailed studies to assess the feasibility of interchangeable sprockets which would enable battlefield interchangeability of track. Germany has encouraged U.S. to adopt the German Diehl track, particularly a planned new "lightweight" version. Adoption of the current Diehl track would add over a ton of weight to the M1 tank and would require expensive redesign of the U.S. sprocket/hub interface, which in turn would influence the M1 system performance. The M1 program manager's office will stay in close touch with Germany to continue its efforts toward tank standardization and interoperability.

The Swiss Government is actively evaluating the M1 as a candidate for upgrading its armored forces. The M1 program manager's office is supporting a technical data evaluation which has included five technical meetings, user and maintenance training programs for the Swiss and release of technical and cost data through proper channels. The Swiss Government has initiated foreign military sales cases to support their evaluation. The program manager's office also participated in the negotiation of a U.S./Swiss memorandum of understanding which is pending signature at the OSD level.

Two M1 production tanks have been undergoing technical and user testing in Switzerland since August of 1981. The tests are scheduled to be completed in June of 1982. A final selection decision is scheduled for 1986/1987.

120MM STANDARDIZATION PROGRAM

The advent of the 120mm standardization program, in 1979, added a new dimension to the M1 tank system. The program encompasses technical translation of available German 120mm weapon designs, development of new rounds, componentry, integration of the 120mm system into the tank, and preparation for produc-

tion. Our prime objective remains to capitalize on available technology and to translate the 120mm cannon and ammunition designs intact. Further, the U.S. Army remains committed to maintain interchangeability between the U.S. and German weapon systems. Besides the larger gun, the M1E1 will incorporate preplanned improvements of modified armor, an overpressure CBR defense system, and an improved transmission, final drives and suspension system.

This program capitalizes on the M1's growth potential. The gun and other improvements I will discuss will help us meet the increased threat. The 120mm tank main armament consists of a German-developed, 120mm smoothbore gun (tube and breech), four types of German ammunition, and a new, highly effective kinetic energy round, the XM829. The XM829 is being developed by the U.S. The gun and the other rounds constitute a technology transfer from German designs, with certain modifications where required to meet U.S. requirements. Technology transfer of the four German rounds—the XM827 kinetic energy armor-piercing round, XM830 chemical energy shaped charge round, and training rounds for each—is being carried out by Honeywell Inc. The XM827, will provide an interim capability until the more capable XM829 can be produced and fielded.

One critical element in the Army's ability to field an M1E1 tank by August 1984 was the availability of U.S.-produced 120mm ammunition to support the fielding of the M1E1 tank fleet. This program was on a high-risk schedule. The technical problems previously listed have led the Army to make a prudent management decision to readjust the 120mm tank gun program schedule by delaying the first production delivery date to August 1985. Among other advantages, this schedule offers the potential to go directly to the XM829 round and bypass the less capable XM827. Going directly to the XM829 presents a major challenge but is clearly worth the effort if it can be achieved.

We have and will continue close coordination with our German counterparts to capitalize on their experience. We also will conduct all tests necessary to assure that this system meets our requirements before we go into production.

We are monitoring German testing and operational use closely to be assured that problems found there are resolved satisfactorily. We are especially cautious of the combustible cartridge case. A specific problem of rounds sticking in the chamber is being resolved by redesign of the combustible cartridge case dimensions. Initial U.S. drop testing of the rounds indicate that the combustible case is not as sturdy as we would desire. Although only preliminary results are available, I have concerns about the ruggedness of the rounds. This is not only a wartime concern. It is particularly significant in a peacetime environment in Europe, where the ammunition may be handled many times as it remains uploaded in a tank for several years. We have run tests firing deliberately damaged rounds, and while we do not have any residue problems, we must be assured we will not have ammunition breakage that presents a safety hazard or that increases overall costs. Testing will be conducted this year to determine the extent of the problem, if, in fact, a problem exists. We have planned and are conducting extensive tests to assure that this ammunition will stand up under the U.S. Army stockpile to target sequence before we make our final decision.

As noted earlier, other improvements will be introduced in 1985. These preplanned product improvements capitalize on the growth potential of the basic M1 tank, and will move us in an evolutionary manner to allow us to continue to meet the treat.

As has been seen recently, the Soviets may use chemical weapons. The M1E1 tank will add an overpressure system that also filters the air, giving our tank crewman a good defensive chemical capability. Our current approach is to adapt components currently on the AH-1 Cobra helicopter, to pressurize the tank. This use of an existing subsystem will allow us to bypass some of the normal development cycle, although extensive on-vehicle tests are planned in 1983.

An additional change is that of an armor modification. The program is low technical risk with a high payoff. This will start into production in late 1984 incorporating this armor into 105mm gun tanks and transitioning it not the 120mm gun version.

Contractor design tests with 63 ton M1E1 test rigs will be run during calendar year 1982. A total of four vehicles are involved in this testing. The purpose of this test is to provde data for refining and ruggedizing M1E1 63 ton hardware configurations, eliminate techical design risks and assess achievability of critical system technical characteristics.

Contractor prototype qualification test (PQT-C) for the M1E1 tank will begin 1 October 1982 and run through February 1983. This testing includes three tanks run for 2,000 miles each and a total of over 1,500 main gun rounds to be fired.

Government testing (PQT-G) will start 1 January 1983 and run through February 1984. These tests are done to validate contractor test results and execute tests not done by the contractor. These tests include the following: RAM-D testing (3 tanks/ 6,000 miles each); firing/automotive performance tests (3 tanks); NBC testing (1 tank); desert test (1 tank); tropic test (1 tank); arctic test (1 tank); EMR/nuclear test (1 tank); and U.S./G.E. interchangeability testing (3 tanks). Since some of these M1E1 tanks are used in one or more of the preceding tests, a total of eight M1E1 tanks are required for DT tests.

Operational testing (OT II) is to be done at Fort Hood with four M1E1 tanks (two new tanks and two tanks from DT II assets) each running at least 1,600 miles and firing a total of over 1,600 main gun rounds. This brings the total tanks required for DT/OT II Testing to 13. OT II testing will evaluate military utility, operational effectiveness and operational suitability. Testing is scheduled to run through April 1984 with an ASARC scheduled for June 1984.

FUNDING

I am pleased to report that we have negotiated our third year production contract for 569 tanks at a unit cost 18 ercent less than projected last year. While that projection was acknowledged at the time to be conservative, the results are encouraging and reflect well on the many individuals and agencies who have helped the PMO in our intensive efforts to reduce costs. Special should cost teams made in-depth reviews at Chrysler Defense, Hughes and Avoc Lycoming to isolate cost drivers, promote cost reduction and assist in the negotiation of a fair contract price. The result is a unit hardware cost of $1.7m compared to $2.1m, projected last year.

FY81/FY82 ABRAMS PROGRAM CHANGES

(ESC $ IN MILLION)

	FY81		FY82	
MARCH 1981	$1660.6M		$2015.9M	
CHANGES				
VEHICLE	0		$-262.2M	
REDUCED TANK COST		(-174.8M)		(-$100.9M)
QUANTITY CHANGE		-		(- 76.0M)
STS FULLY FUNDED		(104.0M)		-
IPF FULLY FUNDED		(93.0M)		-
BIP (TURRET)		-		(+ 72.5M)
FIRE CONTR. 2ND SRC. deferred		-		(- 93.4M)
OTHER		(- 22.2M)		(- 78.2M)
JAN '82 INFL. IND.		-		(13.8M)
ADVANCE PROC.	$- 2.0M		$ 2.7M	
TRAINING	+ 2.0M		.5M	
SPARES	-		- 4.7M	
PBS	- 7.0M		1.8M	
MARCH 1982	$1653.6M		$1754.0M	

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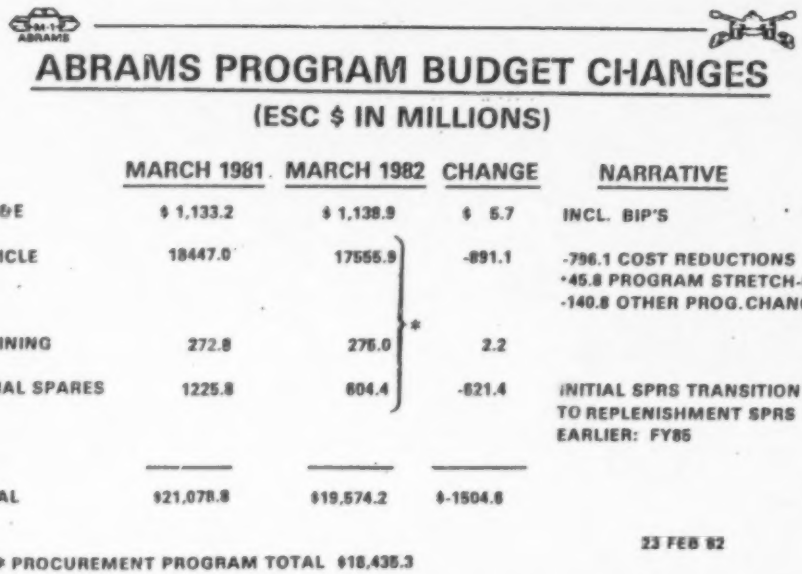
These reductions permitted us to restructure our fiscal year 1981 and fiscal year 1982 programs to fully fund initial production facilitization and systems technical support activities in 1981, making corresponding funds programmed for fiscal year 1982 and later available to offset the impact of budget reductions and fund early initiation of the turret armor portion of our preplanned block improvement program.

It is especially significant that we have absorbed a net budget reduction of $262.2m while reducing quantity be only 55 tanks, about 70 less than would have been required at the earlier projected cost.



In total, these hardware costs projected across the total program result in a reduction of $796m. The reduction of the cost of initial spares is a result of transitioning to replenishment spares three year earlier than originally planned. Previously these costs were included improperly in the selected acquisition report. This has now been corrected and these costs have been transferred to the proper category within the Army procurement budget.

Future cost reduction efforts will focus on improving efficiency in both manufacturing and procurement. I believe these is substantial potential for savings in both areas. We are planning to initiate second sourcing fo fire control in the fifth year; however, these seems to be a potential for substantial savings throgh multi-year procurement of some of these components. We will reassess this approach upon receipt of firm proposals.

In addition to the actions I have just outlined, we are continuing and intensifying productivity improvements at all contractor locations. We are now continuing to ramp up the production rate. The fiscal year 1982 funding year establishes tank production at a rate of 60 per month, to be delivered during calendar year 1983. The fiscal year 1983 budget enables us to increase to nearly 90 units per month, a more efficient and targeted rate. We would begin deliveries at 90 per month in February 1985 (fiscal year 1984 procurement) and sustain that rate throughout the remainder of the program. The ongoing value engineering and cost reduction actions should result in continuing constant dollar reductions in tank hardware cost. As always, there is the caution that inflationary impacts tend to mask true cost reductions.

At this point, let me outline in detail the funding requirements for this program in fiscal year 1983. First, the R.D.T. & E. appropriation:

Fiscal year 1983 R.D.T. & E.

The R.D.T. & E. program is divided into five distinct program elements: M1, M1E1, block improvements, TMAS 120mm gun, and TMAS 120mm ammo.

The base M1 tank program is $12.0m and this dollar amount supports two major areas: (1) completion of the R.D.T. & E. portion of the RAM-D growth program (contractor effort); and (2) completion of technical manual validation/verification activity (government in-house activities).

The M1E1 (120mm) gun integration program of $31.5m is required for continuation of the tank/gun integration to include initiation of DT/OT II testing.

The block improvement program of $42.4m is planned to continue system integration of block 1 improvements into M1E1. Initiate development of block 2 including:

Commander's weapon station and thermal viewer.—This capability provides improved surveillance and enhanced command and control capability for the commander. Concept studies are in progress at Texas Instruments and Hughes Aircraft.

Tank concept studies will be initiated and hardware will be developed for testing during fiscal year 1984.

CO2 laser range finder.—An advanced development of a CO2 laser range finder is underway. This unit will provide the capability to range through battlefield obscurants while providing eyesafe operation. Pilot models are expected for vehicle testing in fiscal year 1984.

Driver's thermal viewer.—The driver's thermal viewer is being developed by NVL for multi-vehicle use. Advanced development models have been received for testing. The models for DT/OT II testing are expected in fiscal year 1984.

The TMAS effort for the 120mm gun ($1.4m) encompasses funding to support continued work on the 120mm cannon. The TMAS 120mm ammo effort ($21.5m) is for continuation of 120mm ammunition development to include initiation of development testing of the high technology KE round (XM829).

Fiscal year 1983 procurement

The fiscal year 1983 procurement request of $2,129.0m supports production of 776 tanks. the funds break out into the following categories:

The production base support program ($45.8m) continues with both recurring costs and new start costs. A total of $22.3m recurring expense is required to rehabilitate or replace equipment and facilities and to repair production facilities as required. The new start monies are required to procure machinery for the block improvement program. ($23.5m).

The PAA funding request Against the M1 vehicle line encompasses two budget lines—regular procurement and advanced procurement.

(1) Regular vehicle procurement costs ($1,457.0m) include basic hardware procurement costs to fund the procurement of 776 M1 units, together with engines (AGT 1500), transmissions and fire control units. Other activities funded by this budget line are recurring system technical support activities, the second source fire control program, special tools and test sets, auxiliary services, 120mm initial production facilitization and government engineering and quality assurance costs.

(2) Advance procurement costs ($432.3m) are required to fund the long lead requirements for 1,080 units including: M1 tanks, engines, transmissions, fire control units and cannons.

The training equipment request ($58.2M) covers the procurement of 26 unit conduct of fire trainers in addition to the procurement of maintenance trainers.

The initial spares and repair parts cost ($135.7M) is the combined requirement of both Tacom and Arrcom. Principal items procured include engines, transmissions and fire control units.

In total, this request has been reduced by $235.0M from that previously included in the March 1981 FYDP. Our revised projection of unit costs has limited the impact on procurement quantity to a net reduction of 26 tanks below the original plan.

SUMMARY

The M1 Abrams tank has met the challenge of achieving initial operational capability in a period of seven years from the start of development and has demonstrated conclusively that it moves, shoots and survives better than any tank in the world. It is a formidable tank offering a quantum improvement in fighting power to our divisions. Production and fielding has slipped from the original schedule but remains essentially on the track we established last year.

Not all problems are solved yet. Ample opportunities for improvement remain. I assure you that we will do our best to solve the problems and take advantage of the opportunities. This notwithstanding, the accomplishments to date are impressive. What remains is for us to build on these accomplishments, improving the performance of the tank and the efficiency with which we produce it. We shall do both. I am assured by our new prime contractor of their full commitment to the achievement of these objectives.

This tank provides our soldiers with the armored capability and growth potential necessary to meet and defeat the formidable threat posed by our potential adversaries in the 1980's and beyond. It must be produced and fielded as rapidly as possible consistent with prudent management. I respectfully request your continued support.

[The questions submitted by the members of the Subcommittee on Tactical Warfare to be answered for the record follow.]

Questions Submitted by Senator Howard W. Cannon

FORCE STRUCTURE

Senator Cannon. Since there will continue to be a large inventory of M60 tanks in service when the M1 is procured in quantity, will there be a mixture of these tanks in a typical division?

At what level of the division structure would there no longer be a mixture—brigade, battalion, company?

General Maloney. The Army is attempting to move to a two tank fleet, M1 and M60A3. The M1 will be introduced in no less than brigade size elements. There may well be a mix of tanks within a division.

COMBAT EMPLOYMENT

Senator Cannon. What is the typical distance over which a combat engagement with tanks would take place? Over this typical distance what would the speed advantage of the M1 over the M60 mean in combat capability?

Specifically, under combat conditions how quickly could the M60 and the M1 expect to cover the typical engagement distance? Would this vary significantly by the type of terrain? If so, what is the likely minimum time it would take to cover this typical distance in the M1 and the M60?

General Maloney. Although it is always difficult to describe a "typical" tactical situation, we generally expect combat engagements with tanks to take place from 500 to 2,500 meters. The speed advantage of the M1 in this range band increases survivability two or three fold in movement from battle position to battle position. In the offense the M1 conducts the close assault much more quickly. Based on empirical data, the M1 covers the typical distance two or three times as fast as the M60. The rougher the terrain, the more accentuated the advantage of the M1. If one quantitatively analysed the performance characteristics of the M1 and M60, the minimum time to cover the distance would be on the order of 30 seconds for the M1 versus one minute for the M60. As indicated before, empirical data derived from experience in the field substantiates this difference.

TANK COST

Senator Cannon. What is the cost of the M60A3 and what is the cost of the M1 on the same basis?

General Maloney. The most accurate comparison is the hardware costs of the two tanks because essentially all support and sunk costs are removed from "hardware" cost estimates. M60 production has long since passed the point of amortizing its development and support costs, while the M1 program is burdened with those same costs. Therefore, the Army estimates the M1 hardware cost at $1.8M in fiscal year 1983 constant dollars and the M60A3 at $1.3 million.

Questions Submitted by Senator Carl Levin

M1 TANK PROGRAM

Senator Levin. General Otis or General Maloney, let's turn to a few more of the questions raised about the M1.

Some people contend we would be better off either buying three M60A3 tanks for every M1, or that we should delay fielding between 100–200 of these tanks while we test it against the M60A3 under combat conditions.

First, is it not true that, at this stage in its development cycle, even with its power train durability less than what we think it will be and want it to be in the near future, the M1 already exceeds the performance of the M60 at a similar state in its development cycle? What are those statistics?

Is it not true that later tests even have demonstrated that the M1 requires less time to repair than the present M60A3, contrary to popular reports? What are those statistics?

We hear a lot about what a gas guzzler the M1 is compared to the M60A3. Even though it has higher fuel consumption, what counts on the battlefield is whether either tank requires more refueling during combat, does it not?

In combat, 100 miles a day is average distance covered. Under combat both the M1 and M60 require only one refueling per day, is this not so?

General Maloney. You cannot buy three M60A3's for one M1. The M1 unit hardware cost is $1.8 million; the M60A3 is $1.3 million. More importantly, the U.S. tank

fleet would still be woefully short of the Soviet Tank fleet (approximately 50,000 tanks) and without the M1 and its vastly superior ability to survive on the battlefield. Under this scenario, the United States would not be able to counter the present or future Soviet tank threat.

Regarding additional M1 testing, the M1 testing to date has been extensive and has thoroughly covered all Army requirements. Furthermore, during the development of the M1 the Army conducted side-by-side testing with the M60. Field exercises were conducted during Operational Test II on a side-by-side basis with the M60 tank at battalion level. Both DT and OT testing have confirmed the M1's superiority to the M60 and the fact that it meets all of the combat requirements established for its performance.

The Army's planned test programs for the M1 are currently funded and represent the best estimate of those actions necessary to ensure the Abrams tank will continue to meet Army needs in the future. Additional vulnerability assessments of the Abrams will be conducted during M1E1 testing as armor improvement programs are incorporated in the evolutionary development of the tank. Additional side-by-side testing with the M60A3 would provide the Army very little, if any, information not currently known and would add unnecessary cost to the price of the tank.

When the M48 and M60 were tested and when the M60 was first fielded, the Army did not have the same test requirements that were used for the M1; therefore, making a comparison of power-train durability from that period is difficult. When the M1 requirements were originally established, an evaluation of available M60 data was completed. Our best estimates from this data (M60A2) indicate a combat reliability of about 242 mean miles between failure (MMBF) with a power-train durability estimated at approximately .25 probability of achieving 4,000 miles without a power-train failure. The M1 has achieved 350 MMBF and .37 probability. Bear in mind this is for a tank automotive system that had been in the field for 12 years. The Army recognized this performance was lower than desired and placed a much higher requirement on the M1, that is, a combat mission reliability of 320 MMBF and power-train durability of .5 probability of achieving 4000 miles without failure of a power-train component. In effect, we set the durability standards for the M1 at about twice the level of the M60's performance and increased the reliability requirement over thirty percent.

During recent testing of the M1 tank, the M1 maintenace ratio was comparable to that of the M60A3 tank; 1.34 hours of maintenance per hour of operation for the M1 to 1.5 hours for the M60A3. As the crews and mechanics become more familiar with the new M1, the maintenance ratio will be further reduced and is expected to reach or exceed the goal of 1.25 hours. Maintainability is a design feature of the M1 tank.

The M1 can operate in combat with one refueling per 24 hour period—the same as the M60. The M1 tank is demonstrating a cruising range of 250 miles on dry, level secondary roads at 25 mph versus a requirement of 275 miles. The M1 has demonstrated 275 miles at 28–30 mph which has been accepted as meeting Army requirements (M1 road speeds exceeded 30 mph during OT III). The M60A3 with the improved RISE engine has demonstrated a cruising range of 280 miles at 20 mph on dry, paved, level roads. These are comparable "EPA"-type measurements. Comparable cross-country mileage for the M1 and M60A3 are 140 miles and 160 miles, respectively. By Army standard operating procedure, tanks are refueled at least daily. Demonstrated operational ranges for the M1 to date are more than sufficient to insure continuous operations, even during intense combat operations. Efforts are ongoing to further improve the operating range of the M1.

M113 INSTEAD OF BRADLEY FIGHTING VEHICLE

Senator LEVIN. General Maloney, two days ago, I asked General Merryman, your boss, whether the Army should buy two or three upgraded M113 armored personnel carriers instead of buying one new Bradley Fighting Vehicle (BFV), since there is a two- or three-to-one price ratio.

He answered: The Army could not field two or three M113 upgrades for one BFV because of manpower constraints.

This same constraint would prevent you from fielding three M60A3's for every planned M1, would it not?

This argues that the Army must try to get the most out of each weapon it can within the manpower constraints, does it not?

General MALONEY. The answer to both questions is yes. It is important to understand that you cannot buy two or three M60A3 tanks for the cost of one M1. The estimated unit hardware cost for the M1 is $1.8M (fiscal year 1983 constant dollars) as compared to $1.3M (fiscal year 1983 constant dollars) for the M60A3. The Army is

manpower constrained so it is extremely important to have well trained soldiers equipped with highly survivable weapon systems capable of the firepower and mobility necessary to defeat a numerically superior enemy.

M1 TESTED UNDER FIRE

Senator LEVIN. General Maloney, the M1 was extensively tested under live fire, was it not? Did this included firing antitank rounds as close as possible to those we believe the Soviets have and will have?

General MALONEY. Yes, this is true. Both simulated Soviet and United States antitank rounds have been fired at the M1 during vulnerability testing. The testing was designed to approximate present and future Soviet threat rounds as closely as possible.

Senator LEVIN. General Lawrence testified about this and said: "All of those scenes vividly demonstrate the superb ballistic protection of the Abrams which was subjected to attack by a number of threats which are likely to be encountered on the battlefield.

"Although the number and severity of those attacks were very high, to include fuel fires and explosions of ammunition, the tank remained operable and fightable; more importantly, instrumentation inside that tank verified that the crew would have survived."

General Maloney, would you agree with this? Could you elaborate on the testing?

General MALONEY. Yes, I do, crew survivability is *the* number one priority designed into the M1 tank. No tank is invulnerable, but the Army is confident of the survivability characteristics of the M1 tank. In addition to the modern armor used in the M1 tank, the crew is further protected by the compartmentalization of both the fuel and ammunition into areas away from the crew. The ammunition compartments have special blow-off panels, that, should an enemy antitank round penetrate and cause the stowed ammunition to begin to explode or burn, the force of the explosion will be vented away from the crew. The M1 tank is equipped with an automatic fire detection and suppression system to further enhance crew survivability. During the vulnerability testing of the M1 tank, more than 3,500 major caliber antitank rounds were fired against the M1 armor, ballistic hulls and turrets and an operational tank in order to test its effectiveness. The crew survivability aspects of the M1 have proven to be far superior to that of the M60, proven through extensive testing of armor, ballistic structures, and a fully combat operational vehicle—a vehicle loaded with ammunition, fuel, hydraulic fluid, etc. These components/vehicle have been shot at or blown up in practically every conceivable way with a multitude of U.S. and simulated Soviet ammunition to ensure the M1 is a sound survivable vehicle.

The overall armor development program culminated in the ballistic test and evaluation of a fully operational prototype tank (PV-11) from September 1978 until March 1979. During this test, the tank was subjected to attack by 13 large caliber antitank munitions and one antitank mine. Whenever possible, the engine was running during each test, and following each test, a soldier crew boarded the tank and checked out all subsystems. The large caliber attacks included five deliberate overmatches of the armor to evaluate the effectiveness of ammunition and fuel compartmentalization. These tests conclusively demonstrated the survivability of the M1 Abrams tank. During this testing, two fuel fires were deliberately started and in both tests, the fire detection/suppression system detected and extinguished the fires. In these large caliber tests, U.S. antitank rounds of the proper caliber were utilized to simulate the terminal ballistic effects of known Soviet antitank munitions.

Ballistic evaluation of the M1 has continued during the Development Test III of Low Rate Initial Production (LRIP) vehicles. During the first year of production, a LRIP ballistic hull and turret was thoroughly evaluated against small arms attack, 9 large caliber antitank munitions attacks, and two land mine attacks. The purpose of these evaluations was to insure that the quality of the armor protection was maintained during the first year of production.

Ballistic evaluation will continue throughout the production process. It is currently planned to evaluate one ballistic hull and turret per year or for every 500 vehicles, whichever represents the more severe requirement. These evaluations will insure that the protection standards will be maintained throughout production.

M1 MORE VULNERABLE THAN M60A3

Senator LEVIN. General Maloney, there have been allegations that the M1 has less armor on its top and sides than the M60A3, and that it is more vulnarable from these angles, as well as from the front.

Is it not true that simple measurements of the thickness of the armor on each tank makes an "apples and oranges" comparison considering that the types of armor on each is so different?

Is it not true that the special characteristics of the M1 armor, even at lesser thickness, exceed the protective capabilities of the M60A3 at greater thicknesses?

Is it not true that the M1's armor provides equal or better protection to the tank crew inside from antitank weapons fired from all angles?

(Comment: M1 armor protection far exceeds M60 armor protection against all Soviet weapons in terms of the probability.)

General MALONEY. Thickness of armor is not a logical comparison between M60 and M1 armor. M1 special armor is totally different and vastly superior to M60 armor. The M1 offers at least equal armor protection from all aspects, and in most cases (especially from the front) far superior armor protection for both vehicle and crew. This has been demonstrated repeatedly in live fire tests against M1 armor and components.

M1 AVAILABILITY

Senator LEVIN. General Maloney, I understand that the availability of the M1 tanks deployed to Europe has been very high—which is testimony to both its lack of breakdowns as well as its ease to maintain.

Would you agree, and could you elaborate with actual availability data?

General MALONEY. Yes, I would totally agree. The recently fielded M1 Battalion in Europe is reporting an average availability rate of over 93 percent. This rate not only is indicative of the tank's maintainability, but also of the excellent new equipment and transition training provided to the crews and maintenance personnel.

Senator LEVIN. Another suggestion heard in Congress is that Congress should withhold $400 million from the fiscal year 1983 M1 request until it is further tested against the M60 and until it demonstrates increased power train durability. This $400 million equates to about 100–200 tanks.

Wouldn't loss of 100–200 tanks reduce our ability to defend Europe for several years; since that is where they would be deployed?

General MALONEY. A loss of 200 M1's at this point in the production and fielding plan would mean three fewer M1 battalions, with their maintenance and war reserve tanks, in the force structure. This redution would definitely have an adverse impact on our defensive strength and credibility in Europe.

I might add that the power-train durability issue is being intensively managed and modifications designed to improve powertrain durability have been incorporated into the production line. The Army expects these modified tanks to meet the power-train durability requirement.

Senator LEVIN. How much more would it cost the taxpayer to build these 100–200 tanks later in the program?

Wouldn't this far offset any increased operations and support costs, should any be needed, to support the M1 if it does not meet its power train durability requirement in the near-term, which it is expected to do?

Please provide details for the record.

General MALONEY. There are at least two important factors to be considered. First, the increased costs incurred by delaying purchase of 100–200 tanks; more importantly, the cost impact on the total program we would suffer by slowing the production ramp-up.

Assuming 200 tanks are tacked onto the end of the program, the procurement cost differential alone would be $80–100 million more in escalated dollars than the current fiscal year 1983 price.

A recent Army study showed that even if power-train durability does not improve through the first 399 tanks, or the first two production contracts, operating and support (O&S) costs would increase by only about $16 million, in fiscal year 1982 dollars. If expected durability improvements don't materialize through the first 968 tanks, or three production contracts, O&S costs increase by another $17 million, again in fiscal year 1982 dollars.

Comparing these O&S increases to the estimated $150–200 million more in fiscal year 1982 dollars it would cost if the production ramp-up were delayed argue conclusively for proceeding with the current plan.

POWER TRAIN DURABILITY

Senator LEVIN. As far as power train durability, the requirement is .5/4000 miles. The M1 is at .37/4000 miles. What kind of improvements are expected and how

soon? Is this based on more recent test data as well as estimates by the Blue Ribbon panel?

General MALONEY. Power-train durability is improving with quality control improvements and fixes for identified problems which have been placed in production. Current power-train durability data presented is based on approximately 17,000 miles of scored test results out of 35,000 miles of durability testing during DT III and OT III. Based on the number of failures encountered to date, the demonstrated durability is expected to be about .37 probability of achieving 4000 miles.

From May 1982 to May 1983, tanks from Lima Tank Plant will be used as a power-train durability demonstration to verify the effectiveness of proposed power train modifications. The PM is currently conducting a two tank power-train durability demonstration at Aberdeen Proving Ground, MD. Over 9,000 miles have been accumulated with no power train failures. These results are not conclusive but are encouraging and support the Army's and Blue Ribbon Panel's assessment that upon the implementation of corrective actions the power train is likely to meet or exceed the required durability in March production tanks.

Senator LEVIN. Mr. Sheley, since GAO's past reports on the M1 tank, and the questions GAO has raised about it, have received much attention, I would like to pose a few questions to you.

GAO recommended that, because of what it considered continuing questions about the M1's power train durability, Congress should consider "conditioning" any funds for increasing the tank production rate until these questions had been resolved.

Is it not true that GAO's recommendation was based on information and test results which probably were out of date by the time the report was issued in mid-December, 1981? I understand that the information cut off was of July/August, 1981, was it not?

Mr. SHELEY. Our recommendation was based on complete operational test results and on development test results as of July 27, 1981. Operational tests were completed before our report was issued the results still pertain today. Development tests were not completed until January 1982 and we have not seen the final results. However, the testers informed us that even if there were no additional durability failures for the remainder of the tests, the power train could not meet the Army's durability requirement based on the mileage remaining to be run.

M1 A LEMON

Senator LEVIN. One of the most widely publicized criticisms attributed to GAO is that the M1 is such a breakdown-prone lemon that it cannot travel more than 30 or 43 miles without requiring repairs.

Is it not true that this overstates the fragility of the M1 because it includes in the calculations done to reach this figure every maintenance item regardless of whether it is a major or minor repair and regardless of whether such a repair would be needed under combat conditions and whether the defect fixed would interfere with the tank performing well in combat?

For example, doesn't this calculation includes repairs to fix a broken switch to signal light as well as a repair if the bottom fell out of the tank?

Doesn't giving equal weight to both major and minor maintenance problems distort drastically the validity of such a calculation? Couldn't it grossly mislead someone seeking to judge whether the M1 and its power train are able to perform on the battlefield?

Under battlefield conditions, many minor repairs would be left undone. They would be in the "nice to do" category, would they not? Wouldn't maintenance focus on those problems which prevented the tank from meeting its combat mission?

Mr. SHELEY. The type of incidents sustained by the M1 tank during testing ran the gamut of the very insignificant to the very critical. The 43 mean miles between essential maintenance actions achieved in development testing at Aberdeen, and the 47 mean miles achieved in operational testing at Fort Knox, considered virtually all maintenance actions, except those that the tank crews could accomplish in 30 minutes or less. About 50 percent of the 1,126 maintenace actions at Aberdeen and about 25 percent of the 1,164 maintenance actions at Fort Knox were repairable within this 30-minute time frame. Presumably this group largely consisted of the least signficant problems.

This still leaves a large number of incidents that required considerable maintenance. The mean time expended on all maintenance actions, including those requiring 30-minutes or less, was 2.67 labor hours at Fort Knox, and 1.71 labor hours at Aberdeen, for every hour of tank operation.

How many of the maintenance actions would be undertaken in combat is difficult to say. But many certainly would have to be, and in combat conditions, it would be more difficult to accomplish the maintenance than under test conditions where repair facilities are more readily available. In 13,300 miles of testing at Fort Knox, for example, 166 roadwheels had to be replaced. The Army did not charge these actions against combat mission reliability. Operating the tank for too long with defective roadwheels increases the wear and tear on the track and the possibility of throwing the track.

Several other types of incidents in themselves did not appear to be of the type that could impede the tank's combat capability, and were so scored. Yet, if not taken care of fairly quickly, their effect over a period of time, could degrade the tank's performance. At Fort Knox, for example, the grating on the rear grille doors of each tank was bent or torn off during the first week of testing. Each time the gratings were repaired or replaced they were damaged again within a few days. The loss of the grating caused the exhaust to be directed downward and caused excessive amounts of dust to be kicked up. The dust increased the tank's signature. It also prematurely clogged the air filters.

Other examples of incidents not scored as a combat mission failure included incidents where the transmission would not engage in reverse; engine blew excessive blue smoke; auxiliary hydraulic pump malfunctioned and had to be replaced; steering linkage adjust rod was broken; steering cable was inoperative; engine aborts; main hydraulic pump stopped working; and parking brake would not engage.

M1 COMBAT MISSION CAPABILITY

Senator LEVIN. The Army's requirement for judging whether the M1 can accomplish its mission in combat—its combat mission reliability—is that the M1 be able to operate on average for 320 miles without suffering a failure in a major component which would require significant maintenance or replacement, thus scrubbing the tank from its mission. On this basis, is it not true the M1 is exceeding its goal and is demonstrating 350 miles between failure?

Mr. SHELEY. The 1981 test results, scored in accordance with Army criteria, confirmed that the M1 exceeded the Army's combat mission reliability requirement.

Senator LEVIN. The test results which GAO analyzed as a source of concern came from tanks which were among those which came off the production line early in the program, weren't they? These tanks could be expected to demonstrate reduced performance, compared to those which came off the production line later, after the line had been operating for many months, couldn't they?

Mr. SHELEY. Many of the types of problems that were noted in the 1981 tests were attributable to inadequate quality control. It is logical to expect that tanks now coming off the production line would have far fewer quality control problems, especially after the earlier problems were called to the prime contractor's attention.

Senator LEVIN. Two weeks ago. I asked the Army's European Commander, General Frederick Kroesen what he and his troops thought of the M1. I specifically asked him "is this tank a repair-prone lemon, or is this a tank which is the best available tank in the world? We hear two different reports on this," I said, "What is your field experience so far with it?"

General Kroesen answered: "None of the problems that have been highlighted in the press have come to our attention in Europe. The soldiers who are now equipped with it believe it is the best tank in the world. I believe it is the best tank in the world from what I have seen of it."

"* * * we know already that maintenance at the unit level of operators and tank crew themselves has been simplified and they are most pleased with their ability to take care of that tank."

General Kroesen even said: "There is a great deal of enthusiasm among those battalions which now have it and which will receive it this year. In fact, we have soldiers extending their tour of duty in those battallions in order to serve a tour with the M1 tank."

Doesn't this contradict GAO's conclusions about the M1? Did GAO travel to Europe to interview these soldiers?

Mr. SHELEY. In terms of access to tank components and ease of maintenance the M1, for the most part, is easier to maintain than its predecessor, the M60. At the time of our review the M1 had not yet been deployed in Europe. However, we heard the same enthusiastic reaction from troops we talked to at Fort Knox and Fort Hood as was expressed more recently by the troops in Europe.

Nevertheless, we do not believe that this contradicts our conclusion that the degree of maintenance required, as shown by the test results, could affect the tank's

performance. The frequency of maintenance is still a concern. At the same time, the "maintenance ratio" should decline with improvements to the test equipment and test manuals, and with more experience in maintaining the tank.

SOLDIERS IN FIELD BACK M1

Senator LEVIN. There has been much ado in the press about how GAO investigators and "outside experts" have raised questions about the M1. There has been too little about how the soldiers in the field, the consumers whose very lives depend on the M1, and who will have to operate and maintain it, regard the new tank. In a much over looked hearing last year before the House Armed Services Committee, General Richard Lawrence, commander of the first armored unit to receive the M1, at Fort Hood, Texas, had this to say:

"Gentlemen, as a combat commander of an armored division, I am vitally interested in four key characteristics: survivability, mobility, firepower and maintainability. Out at the spearpoint where we joint the battle, I think that these characteristics are very crucial to the victory of tanks and crews in combat * * *"

Would GAO experts agree with this?

Mr. SHELEY. We agree with General Lawrence.

Senator LEVIN. General Lawrence continued:

"For most armored armies, the critical characteristic of a fighting vehicle is survivability in combat. Survivability, of course, relates to longevity and longevity in battle affords us an opportunity to kill more of the enemy while we are minimizing our own losses."

"Survivability also has the greatest impact on a soldier's confidence, and confidence breeds fighting effectiveness."

GAO has no reservations about the M1's survivability, does it?

Mr. SHELEY. We have not specifically examined into the M1's survivability since 1976. At that time tests by the Army's Ballistics Research Laboratory showed excellent results being achieved in the area of survivability. We are not aware that there has been any change.

Senator LEVIN. General Lawrence testified about this and said:

"All of those scenes vividly demonstrate the superb ballistic protection of the Abrams which was subjected to attack by a number of threats which are likely to be encountered on the battlefield."

"Although the number and severity of those attacks were very high, to include fuel fires and explosions of ammunition, the tank remained operable and fightable; more importantly, instrumentation inside that tank verified that the crew would have survived."

Mr. Sheley, can you attest to this?

Mr. SHELEY. So far as we know the armor's ability to withstand a hit is as stated by General Lawrence. We have no information on the effect of the impact on the crew's ability to continue functioning.

M1 SAFETY AND SURVIVABILITY

Senator LEVIN. There have been allegations from outside experts that the M1 is not as safe and survivable for its crews than the present M60A1 and M60A3 tanks which have the same armor—which itself is different from the M1 armor. General Lawrence, the troop commander had this to say:

"Most of the shots would have catastrophically destroyed the M60A1 or at least made it combat-ineffective with much greater casualities in armor crewmen, and I will tell you that my troopers understand this difference very well.

Mr. Sheley, would you agree?

Mr. SHELEY. We agree with General Lawrence.

Senator LEVIN. Turning to maintaining the M1, and its availability for combat, this was a source of criticism from the GAO in its last reports—one on its logistics program and the latest in December on the overall program.

Today, Mr. Sheley indicated that the M1 tank's availability for combat could be low because of mechanical problems, and that this could offset the tank's superior firepower, mobility and armor.

General Lawrence, however, had this to say:

"* * * based upon the constant and continuing field experiences with the Abrams and the A1, we believe that the Abrams is much easier to maintain than the M60A1.

"With the M60A1, maintenance time for many tasks is increased because of the poor accessibility of the failed components, but on the Abrams tank, approximately 70 percent of the engine accessories and components can be replaced without remov-

ing the power package, but if we have to remoe the power package, our Abrams tank crews can do so in less than one-half the time it takes to perform the same task on the M60A1."

Mr. Sheley, couldn't this increase the M1's combat availability?

Mr. SHELEY. Easier access to components is a plus in reducing maintenance time and, consequently, increasing combat availability. However, combat availability is affected by the frequency of required maintenance and by how long it takes to make the repair after gaining access to the defective component. The M1's maintenance ratio at Fort Knox and at Aberdeen was higher than the Army's goal. At Fort Hood, none of the tanks tested accumulated more than a few hundred miles—too few to permit a meaningful assessment.

MILITARY REFORM CAUCUS

[Senator Goldwater requested the Army to provide their response to the proposal of the Military Reform Caucus to withhold funds for the M1 tank. That response follows:]

SUBJECT: ARMY REJOINDERS TO MILITARY REFORM CAUCUS INITIATIVE TO WITHHOLD FUNDS FROM THE M1 TANK PROGRAM

1. *Background.*—The Military Reform Caucus has developed several initiatives for changes in the Defense budget. One of the major initiatives presented is to "Withhold $400M in M1 tank funds to force testing of major M1 deficiencies". The M1 tank has demonstrated, through extensive and intensive testing, that it meets or exceeds all critical combat mission and system requirements, is far more survivable than any previous U.S. tank (and probably any tank in the world) and it enjoys the total support and confidence of those soldiers that have direct experience on both the M60 and the M1. The M1 is in full production, has been fielded in CONUS, and is being fielded in Europe today. This reform Caucus initiative is, therefore, both distressing and puzzling—the facts do not support this initiative.

2. *Rejoinder.*—Allegations by the Military Reform Caucus together with Army rejoinders follow:

Allegation.—"The M1's unprecedented breakdown rates (mostly due to the gas turbine engine and complex electronics) will cause it to be the slowest tank in the world—in real battlefield situations."

Rejoinder.—The M1 has not experienced an unprecedented breakdown rate. The M1 has exceeded its overall combat mission and system reliability requirements in the most extensive testing ever given a U.S. tank—in excess of 70 tanks tested with an accumulation of about 200,000 miles driven and 33,000 main gun rounds fired. The proven performance of the M1 is:

Combat Mission Reliability—350 mean miles between failures (MMBF) achieved versus a requirement of 320 MMBF. The first production year M1's combat mission reliability of 350 mean miles between failure compares very favorably with the M60's especially when one considers that the M60 after 12 years in production had only achieved 242 MMBF, and after twenty years and extensive evolutionary improvements to increase its reliability, the M60 is achieving 407 MMBF.

System reliability—126 mean miles between failure achieved versus 101 required, 24 percent better than expected.

Power train durability is a subset of the tank's combat mission and system reliability. In testing to date, the durability of the M1 power train (engine, transmission, final drive) has not yet met the Army's requirement—.37 versus .5 probability of going 4,000 miles without replacement of one of the three components. Both the Army, and a specially convened Blue Ribbon Panel of industrial experts, assess that the M1 will meet or exceed the power train durability requirement with March 82 production tanks which will incorporate modifications for previously indentified deficiencies. It is important to note that power train durability primarily affects the operation and support costs of the tank, clearly an important consideration, but one which has not impacted significantly on combat capability nor prevented the M1 from exceeding its tough combat reliability goals.

The "complex electronics" problems referred to are not understood. M1 electronics systems have proven reliable, any failures of these items are included as subsets of the overall vehicle reliability assessment. All recurring failures evidenced in testing have either been corrected in production vehicles or are being addressed as part of the continuing effort to improve M1 RAM-D characteristics.

Testing of the M1's reliability has been accomplished in as close to a real combat environment as possible using representative soldiers from units, from the tank crew through general support levels of maintenance; not technicians. It was and is being operated and maintained by soldiers.

Far from being "the slowest tank in the world—in real battlefield situations", the M1 has proven itself unequaled in speed, acceleration, agility, and battlefield mobility.

Allegation.—"In addition large numbers of American tankers are likely to die unnecessarily due to * * *":

"The M1's highly flammable hydraulic fluid".

Rejoinder.—Not true. Fire retardant hydraulic fluid was adopted for use in the M60 tank as a result of the 1973 Arab-Israeli war experience. The M1 tank was designed to use the same hydraulic fluid as the M60. This fluid has a much higher flame ignition temperature than that used prior to 1976 and it significantly lowers

the possibilities of hydraulic fluid fires in the crew compartment. Additionally, hydraulic lines and connectors have been strengthened to reduce the possibility of rupture. An automatic fire detection/suppression system that uses Halon gas to smother fires detected in either the crew or engine compartments has made the M1 significantly more fire-safe than previous U.S. tanks. These were specifically designed into the M1 to minimize casualties due to fire.

"Ineffective automatic fire extinguishers":

Rejoinder.—Not true. Should an engine or fuel cell fire occure, the automatic fire detection/suppression system will detect the fire (heat and smoke) and extinguish the fire within 150 milliseconds of initiation. A manual second shot capability in the engine compartment assures protection against flare-ups after the initial fire has been extinguished. The system has been thoroughly and realistically tested. Fires have been deliberately set in a fully operational combat configured vehicle, loaded with fuel and ammunition, and the fire detector/suppression system successfully detected and extinguished the fires. The M1 fire suppression system is a significant step forward in enhancing crew and vehicle survivability.

"Side and rear armor thinner than the M60".

Rejoinder.—The allegation implies that the M60 offers better side and rear protection than the M1. This is false. Thickness of armor is not a logical comparison between M60 and M1 armor. M1 special armor is totally different and vastly superior to M60 armor. The M1 offers at least equal armor protection from all aspects, and in most cases far supreior armor protection for both vehicle and crew. Again, this has been demonstrated in live fire tests against M1, armor and components.

"Machineguns incapable of protecting the tank against infantry".

Rejoinder.—This is an incorrect statement. The M1 has three machineguns, one more than the M60. All three can effectively engage infantry in close proximity to the tank. The M1 crew can provide machinegun coverage 360° around the tank.

"The strikingly detectable hot turbine exhaust".

Rejoinder.—Thermal detection technology is such that all tanks are readily detectable. Visually, however, the M1 turbine exhaust is not detectable at all while the M60, and all diesel engine powered tanks, have a visible exhaust, particularly when accelerating.

"Turbine exhaust that will act as a magnet for missiles".

Rejoinder.—This is an overstatement which seems to be based on pure conjecture. If the Soviets employ a heat seeking antitank missile, and they do not appear to have one at this time, it would be able to attack diesel engine powered tanks as well as the turbine powered M1. In other words, this potential threat exists for all combat vehicles, not just the M1.

"Hot turbine exhaust * * * will prevent operations in dry woods".

Rejoinder.—Another incorrect statement which presents a problem where there is none. In over 200,000 miles of testing, much of it in cross country movement over terrain of varied vegetation, to include dry grass and woods, the M1 has not started a fire that we are aware of. The M1, categorically, can operate in dry/wooded areas.

Allegation.—"Not only has the Army not fixed these problems, it has refused to do the testing necessary to determine their real severity."

Rejoinder.—As previously stated, the M1 is the most extensively tested U.S. tank ever. Any problems found in testing have been corrected, corrective action has been initiated, or corrective action is planned for some logical point in time. The alleged problems outlined in the attached initiative are for the most part not true or not of major significance to the combat performance of the M1. It is particularly distressing, however, to know that members of Congress believe the Army has disregarded the survivability of its tank crews. The major thrust of the reform Caucus' M1 tank initiative is to "reflect the military reform movement's seriousness when it says people (and their lives) are more important than hardware." The Army is totally and completely in agreement with this statement. Crew survivability is the number one priority designed into the M1 tank. No tank is invulnerable, but the Army is confident of the survivability characteristics of the M1 tank. In addition to the modern armor used in the M1 tank, the crew is further protected by the compartmentalization of both the fuel and ammunition into areas away from the crew. The ammunition compartments have special blow-off panels, that, should an enemy antitank round penetrate and cause the stowed ammunition to begin to explode or burn, the force of the explosion will be vented away from the crew. The M1 tank is equipped with an automatic fire detection and suppression system to further enhance crew survivability. During the extensive testing of the M1 tank, more than 3,500 major caliber antitank rounds were fired against the M1 armor, ballistic hulls and turrets and a vehicle in order to test its effectiveness. The crew survivability aspects of the M1 have proven to be far superior to that of the M60, proven through

extensive testing of armor, ballistic structures, and a fully combat operational vehicle—a vehicle loaded with ammunition, fuel, hydraulic fluids, etc. These components/vehicle have been shot at or blown up in practically every conceivable way with a multitude of U.S. and Soviet ammunition to ensure the M1 is a sound survivable vehicle.

3. *Additional M1 testing.*—The M1 testing to date has been extensive and has thoroughly covered all user requirements. Furthermore, during the development of the M1 the Army conducted side-by-side testing with the M60. Field exercises were conducted during Operational Test II on a side-by-side basis with the M60 tank at platoon level and during Operational Test III on a force-on-force basis with the M60 tank at battalion level. Both DT and OT testing have confirmed the M1's superiority to the M60 and the fact that it meets all of the combat requirements established for its performance.

In conjunction with the M1 RAM-D growth program which is designed to increase the reliability of critical M1 components, such as the engine, the M1 Program Manager will conduct a comprehensive component improvement test program which will extend into fiscal year 1984.

Since the inception of the M1 program, maximum emphasis has been directed toward achieving high levels of crew and vehicle battlefield survivability. Testing has been extensive and will continue as armor is improved to meet projected new threats.

The Army's planned test programs for the M1 are currently funded and represent the best estimate of those actions necessary to ensure the Abrams tank will continue to meet Army needs in the future. Additional vulnerability assessments of the Abrams will be conducted during M1E1 testing as armor improvement programs are incorporated in the evolutionary development of the tank. Additional side-by-side testing as proposed by the Caucus would provide the Army very little, if any, information not currently known and would add unnecessary additional cost to the price of the tank.

[1 Enclosure.]

MAJOR INITIATIVE: WITHHOLD $400M IN M1 TANK FUNDS TO FORCE TESTING OF MAJOR M1 DEFICIENCIES

The M1's unprecedented breakdown rates (mostly due to the gas turbine engine and complex electronics) will cause it to be the slowest tank in the world—in real battlefield situations. In addition, large numbers of American tankers are likely to die unnecessarily due to the M1's highly flammable hydraulic fluid, ineffective automatic fire extinguishers, side and rear armor thinner than the M60, machineguns incapable of protecting the tank against infantry, and the strikingly detectable hot turbine exhaust that will act as a magnet for missiles and will prevent operations in dry woods. Not only has the Army not fixed these problems, it has refused to do the testing necessary to detemine their real severity.

To force the Army to address these life-endangering problems; this initiative withholds $400m of the fiscal year 1983 request for M1 funds until the Army conducts, side-by-side with the M-60, adequate field tests of: (a) M1 versus M-60 operational mobility and reliability without contractor assistance; (b) machinegun effectiveness against hidden and close-in infantry; (c) expected crew casualties in M1's and M-650's loaded with hydraulic fluid, fuel and ammunition, as determined by live firing or actual Soviet rounds; (d) the relative ability of Maverick and Sidewinder missiles to lock onto the M1 and M-60, and (e) repair time for simulated battle damage. All tests must be done with GAO observers present.

This initiative would reflect the military reform movement's seriousness when it says that people (and their lives) are more important than hardware.

DEPARTMENT OF THE ARMY,
OFFICE OF THE DEPUTY CHIEF OF STAFF
FOR RESEARCH, DEVELOPMENT, AND ACQUISITION,
Washington, D.C., February 10, 1982.

DAMA-WSW
Mr. BENJAMIN C. BRADLEE,
Washington Post, Washington, D.C. 20071.

DEAR MR. BRADLEE: I have read Mr. Pincus' article of February 9 entitled "New Tank Needs an ACE to Dig a Hole". I am dismayed. Once again your paper has presented a one-sided and deceptive view of Army programs to the public.

The article, which discusses the M1 tank and the Armored Combat Earthmover, is a misleading mixture of facts and misconceptions which will certainly bring the reader to false conclusions about the Army's tank fleet past and present.

It is true that the M1 tank's engine and transmission would require modifications to allow it to do the job of a bulldozer. But the article followed with a misconception that older tank can act as bulldozers and that the Armored Combat Earthmover is intended only to "dig in" tanks, when in fact it does many other tasks, serving as a support work vehicle for the entire force. The article would lead one to conclude that the Army is spending billions of dollars on a new tank and a new armored combat earthmover to do what older tanks are capable of doing. Not true! The facts of the matter are these:

No U.S. tanks have a bulldozing capability. Normally, one tank per company is outfitted with a blade. The blade is simply dropped on the ground, where its weight allows it to act as a scraper, capable of clearing obstacles from a roadway or doing minor earthmoving in soft soil. Our older tanks have such a blade, and so will the M1. As with older tanks, one M1 per tank company will be so equipped. But this is a far cry from the digging capability provided by a bulldozer, whose hydraulics are used to force the blade into soil, even hard soil, scooping deep and moving tons of earth very rapidly.

A tank's engine and transmission are designed to give the tank high speed and agility. A bulldozer is optimized for power, at low speed. The tank's tracks and suspension are designed to minimize ground pressure for high cross-country mobility over all types of terrain. A bulldozer must have great traction; therefore, it uses a cleated track with high ground pressure. Putting a blade on a tank does not make it a bulldozer just as putting a cannon on a bulldozer does not make it a tank. Each has its own job to do and is designed accordingly.

But the question remains, why can't the Army do the bulldozer's job with a commercial bulldozer? Answer: The commercial bulldozer cannot keep up with or survive with the forward edge of the Army in the field. The Armored Combat Earthmover can. The ACE has sufficient speed to accompany the armor force, and has sufficient armor protection to keep its operator from being killed by shell fragments or small arms fire. We learned in WWII and in Korea that this protection is absolutely required.

Is it worth the cost? The Army believes that it certainly is. The Washington Post article quoted correctly a first year cost of $1.1M per ACE, for 30 ACE vehicles. But the article failed to advise the reader that the Army expects costs of about $600K each on future procurements of much larger numbers of ACE vehicles. Incidentially, a commercial bulldozer or similar earth-moving capability with its tractor and trailer (required to move it but not needed with the ACE) would cost about $300K, so the Army isn't paying too much of a premium to keep up with the battle and protect the driver. And the ACE does a lot more than dig in tanks. It can, while under hostile fire, clear barbed wire or tank obstacles, prepare river crossing sites, and prepare antitank obstacles. It is air-transportable in even the relatively small C-130 aircraft, and it can be dropped by parachute.

I request that this letter be printed in its entirety, and that if Mr. Pincus' article was distributed to other news agencies, that this letter be distributed to those same agencies.

The Army is always interested in providing the facts concerning its activities. I again invite you to request our assistance in the future so we may aid you in presenting balanced articles to your readers.

Sincerely,

JAMES P. MALONEY,
Major General, General Staff,
Director of Weapons Systems.

Attachment.

[From the Washington Post, Feb. 9, 1982, pg. 1]

NEW TANK NEEDS AN ACE TO DIG A HOLE

(By Walter Pincus)

The Army's new high-speed and high-cost M1 tank has had its share of problems, and now comes a new one.

Its transmission is so delicate that it cannot do what previous tanks have traditionally done and dig itself in when it arrives where it wants to be.

So the Army has come up with a companion vehicle, called ACE, which will travel along with the M1. ACE stands for Armored Combat Earthmover. It's what a civilian might call a high-speed bulldozer.

M1's cost more than $2.5 million apiece. The Army wants more than 7,000 of them, or about $19 billion worth.

The ACE's cost about $1.1 million apiece. The Army is said to want more than 600 of them. That is at least another $600 million.

And then there is the fuel problem. The M1's not only have delicate transmissions, they are gas guzzlers.

To keep each battalion of M1's supplied with fuel, the Army says it will need 26 additional fuel trucks and tanks. These will cost $632,000 per battalion. The number of planned battalions is classified, but experts say it is almost sure to be more than 100. That is $63 million more.

The M1 and its trail-along vehicles are an example of a problem now plaguing the Army. Many of its proposed new weapons systems are running beyond their original cost estimates. Even defenders acknowledge that the Army is thus likely to be one of the main targets for defense budget cutters on the Hill this year.

The ACE is programmed to travel 30 miles an hour on the battlefield. Army officers say that it is needed and that it will be able to do the job much better than the old D7 military bulldozer, which has to be carried by a tractor-trailer and on its own can go no faster than five or six miles an hour.

Tanks normally dig in on the battlefield either to fire or to protect themselves from the enemy. Older tanks can have a blade attached to do the digging themselves. Or they wait for the slower bulldozers to arrive, carried by tractor-trailers.

At a congressional hearing last year, Army Chief of Staff Gen. Edward C. Meyer said that in order to install a blade on the M1 "you would have to use a different engine, different transmission, suspension, and make other significant modifications to be able to do the kinds of earthmoving tanks require."

That is why, for years, the Pacific Car and Foundry Co. of Renton, Wash., and the Army have been trying to sell Congress on the speedy, versatile armed bulldozer.

Not until last year did Congress approve $40.7 million for the Army to buy the first 36 of the earthmoving machines. Now there are plans to produce up to 100 a year for more than six years.

For the first three years that the Army sought the vehicle, the House Appropriations subcommittee on defense turned it down. During those years, congressional sources said yesterday, the Army had not appeared to be very enthusiastic about the bulldozer, which in those days was called the Universal Engineering Tractor or UET.

Then, last year, things seemed to change. The system was given its new name and jazzier acronym, ACE. It also was more actively supported than before by subcommittee member Norman D. Dicks (D-Wash.), in whose state the ACE is built.

The Army, sources said, buoyed by an increasing Reagan defense budget, "got its act together and decided what missions the ACE was to perform."

Dicks got the Army to report on a test that showed the ACE during maneuvers resulting in "significant increases in task force combat effectiveness, evident in increases over 22 percent in the ratio of enemy to U.S. weapons systems losses."

The Army, with new enthusiasm, described ACE as "not only affordable, but in terms of weapons system survivability, absolutely necessary." As a clincher, it was linked to the Rapid Deployment Force because, unlike the traditional bulldozer, it was "both air-transportable and air-droppable. . . ."

Congress bought the argument and the ACE started to roll, but at some cost.

When the new bulldozer was first proposed in fiscal 1978, its cost was put at $200,000 per unit. By 1979, the price was $660,000, and by April last year, when the Army testified about it before the House subcommittee, it had risen to $1.1 million.

The new version of the old Army bulldozer, including the tractor-trailer to carry it around, would cost only $300,000, according to Army officials.

DEPARTMENT OF THE ARMY,
OFFICE OF THE DEPUTY CHIEF OF STAFF
FOR RESEARCH, DEVELOPMENT, AND ACQUISITION,
Washington, D.C., January 27, 1982.

DAMA-WSW.
Mr. JOSEPH PULITZER, Jr.,
St. Louis Post Dispatch,
North Tucker Boulevard, St. Louis, Mo.

DEAR MR. PULITZER: I am disappointed in the Post-Dispatch's article of January 12, 1982, entitled "Another GAO Warning". The article presents a one-sided and

misleading view of the tank program and has misinformed our readers. I wish to provide information which I believe will help to balance the story.

The major inaccuracy in your article is contained in the statement—"The power train, which is made up of the tanks engine, transmission, and final drive unit, showed only a 37 percent probability of meeting the Army's requirement of being able to operate for 4,000 miles without having to replace major components." This would lead your readers to believe the tank hs achieved only 37 percent of a 100 percent requirement to go 4,000 miles without a power train failure. Not so. The Army's very stringent requirement is a 50-percent probability of going 4,000 miles without a power train failure. So our tests have shown that we are 13 percent short of our goal, not 63 percent.

But the shortfall raises the question—What has the Army done to fix the power train problems? And why is the Army moving ahead with increasing production of the tank while the GAO counsels that production be held down?

Here are the facts: During the early stages of testing the M1, several power train failures were experienced. Each failure ws analyzed and fixes were made to the faulty component or quality changes were incorporated into the production line. As testing continued, although some additional power train problems occurred, an improving trend was obvious. But the number of early failures made it statistically impossible to achieve the durability goals before the end of testing. The Army's analysis of the improving trend indicated that the fixes made during testing would result in a production tank that would meet or exceed our requirement, that is, a "50 percent probability of being able to travel 4,000 miles without a power train failure requiring the replacement of a major component (engine, transmission, or final drive)." As a check to our analysis, we convened a panel of civilian industrial, scientific, and technical leaders to independently evaluate the M1's power train durability. In August 81, the panel reported that after already-designed corrections are made to the M1's power train, durability should meet or exceed the requirement. These corrections have been made and will show up in tanks rolling off the production line in March of this year.

It should also be noted that power train durability is not the true measure of the tank's combat capability. The combat mission reliability goal is 320 miles between failures. The M1 has in fact achieved, in testing, 350 tough miles between failures. So we believe there is very little risk involved in going to higher production rates. We believe that to follow the GAO-proposed stretch-out of production would needlessly increase program costs and delay the build-up of this vital weapon. That would penalize both the taxpayer and the soldier.

Let me turn to the issue of cost. Your article states that there have been cost overruns. That is not so. The M1 price has increased in the past 10 years (no surprise!); however, after eliminating the effects of inflation, the cost of the M1 today is only about 5 percent above our early forecast. More perspective can be gained by considering what we call the unit hardware cost. At the same time we paid $1.7 million for an M1 tank, we paid $1.2 million per copy for our M60A3 tanks . . . a much less capable tank than the M1, and one which has been in production for about 20 years. So, although tanks are not cheap these days, the M1's price is not out of line when a comparison check is made.

The Soviet Union has five times as many tanks as we, and many of their tanks are more capable than ours, excepting the M1. The Soviets continue to produce tanks at a great rate. This country cannot afford to be faint-hearted or ultra-conservative in its development and fielding of urgently needed weapons systems. The M1 tank is needed now and it is ready for fielding. Your Army's best efforts are being directed toward rapidly producing as many high quality tanks as possible. We are in production following the most extensive testing ever accomplished for an Army tank. To date, 274 M1's have been delivered and are serving the Army well. Our soldiers strongly praise the M1. It is a great tank. America can be proud of it.

Sincerely,

JAMES P. MALONEY,
Major General, General Staff,
Director of Weapons System.

[Attachment.]

[From the St. Louis Post-Dispatch, Dec. 31, 1981, Jan. 12, 1982]

ANOTHER GAO WARNING

President Reagan's rearmament drive may be barreling full-speed down the track, but he keeps getting warning signals from the General Accounting Office that he

should slow down in order to avoid crackups along the line. The latest GAO warning is on the Army's new M1 Abrams tank.

The M1 has been in development for nearly 10 years and has had more than its share of technical problems and cost overruns. Despite it all, though, the Army pushed the program into production in 1980. But now the GAO is questioning whether the M-1 should be in full-scale production.

The most recent GAO report on the tank found that while the M-1 is in many ways a good design and "should perform well in combat," the tank still has a serious durability problem with its power train. The power train, which is made up of the tank's engine, transmission and final drive unit, showed only a 37 percent probability of meeting the Army's requirement of being able to operate for 4,000 miles without having to replace major components. The GAO recommended that Congress "consider conditioning future appropriations for large production of the M-1 on the power train meeting the Army's durability requirements."

It is to be hoped that Mr. Reagan and Congress listen to the GAO and make sure that the problem is fixed now. The M-1 may prove to be an excellent tank, but if the engines and transmissions keep breaking down, it will be only an overpriced pillbox.

DEPARTMENT OF THE ARMY.,
OFFICE OF THE DEPUTY CHIEF OF STAFF
FOR RESEARCH, DEVELOPMENT, AND ACQUISITION,
Washington, D.C., January 11 1982.

Mr. BENJAMIN C. BRADLEE,
Washington Post,
1150 15th Street NW., Washington, D.C.

DEAR MR. BRADLEE: I am disappointed in the Post's article of January 6, 1982, entitled "GAO, Army in a Standoff Over Cranky Tank." The article and the report present a one-sided and misleading view of the tank program. I wish to provide information which I believe will help to balance the story.

The GAO report referenced in your article states that the M1 tank's power train, which includes the engine and transmission, has not met the Army's requirements (true), and that production should be held down until it is fixed. The Army does not want to hold down production of the M1; in fact, we want to speed it up. Why does the Army view differ from that of the GAO? Here are the facts: During the early stages of testing the M1, several power train failures were experienced. Each failure was analyzed and fixes were made to the faulty component or quality changes were incorporated into the production line. As testing continued, although some additional power train problems occurred, an improving trend was obvious. But the number of early failures made it statistically impossible to achieve the durability goals before the end of testing. The Army's analysis of the improving trend indicated that the fixes made during testing would result in a production tank that would meet our requirements, that is, a "50 percent probability of being able to travel 4000 miles without a power train failure requiring the replacement of a major component (engine, transmission or final drive)." As a check to our analysis, we convened a panel of civilian industrial, scientific, and technical leaders to independently evaluate the M1's power train durability. In August 1981, the panel reported that after already-designed corrections are made to the M1's Power train, durability should meet or exceed the requirement. These corrections have been made and will show up in tanks rolling off the production line in March of this year. So we believe there is very little risk involved in going to higher production rates. We believe that to follow the GAO-proposed stretch-out of production would needlessly increase program costs and delay the build-up of this vital weapon. That would penalize both the taxpayer and the soldier.

Let me turn to maintenance needs. Your paraphrase of the GAO report: "* * * that M1, does everything except run reliably, * * *" is partially correct. It does everything (well, almost). It also runs reliably. but, to prove your point, you cite that "In tests * * * the M1's averaged 48 and 43 miles, respectively, before the needed 'essential maintenance' * * *" The test statement is true, but provides a classic example of the distortion that can result from selective reporting. The "48 and 43 miles" are the total cumulative test miles divided by the total number of needed maintenance actions regardless of the significance of the maintenance action. So, a minor adjustment made by a mechanic is counted the same as replacement of an engine. The result is a useful number, but is not a valid measure of the tank's combat capability. In fact, we do measure the tank's combat mission reliability: The M1 achieved 350 tough miles between failures, the goal was 320 miles. This is very, very good for early models of a new tank.

Finally, cost. Your article say the M1 costs $2.6 million per copy. This figure includes not only the cost of the tank itself, but all the costs for research and development, logistics support such as repair parts, and the facilities to build the tank. In fact we are paying Chrysler $1.7 million per tank. This is a lot of money, but it interesting to note that the Army paid $1.2 million per copy for our last order of M60A3 tanks * * * a much less capable tank than the M1, and one which has been in production for about 20 years. The M1's price is not out of line.

The Soviet Union has about five times as many tanks as we, and many of their tanks are more capable than ours, excepting the M1. The Soviets continue to produce tanks at a great rate. This country cannot afford to be faint hearted or ultra-conservative in its development and fielding of urgently needed weapons systems. The M1 tank is needed now and it is ready for fielding. Our best efforts are being directed toward rapidly producing as many high quality tanks as possible. We are in production following the most extensive testing ever accomplished for an Army tank. To date, 272 M1's have been delivered and are serving the Army well. Our soldiers strongly praise the M1. It is a great tank. American can be proud of it.

Sincerely,

JAMES P. MALONEY,
Major General, General Staff,
Director of Weapons System.

[Attachment.]

[From the Washington Post, Jan. 6, 1982, pg. 21]

GAO, ARMY IN A STANDOFF OVER CRANKY TANK

The General Accounting Office, taking note of the fact that the Army's new main battle tank, the M1, does everything except run reliably, has recommended that only a relatively small number of the tanks be purchased until the problems are solved. The Army relying on assurances of blue-ribbon panel that the trouble can be fixed, told the GAO it intends to go ahead and buy 720 of the new tanks this year.

The M1, built by Chrysler, "has been impressive in demonstrating its shoot-on-the-move capability, it speed, its ability to rapidly traverse rugged terrain, and the protection afforded by its armor," GAO said. But the power train—including the engine and transmission—failed to meet the Army's requirements. In tests at Fort Knox and the Aberdeen Proving Ground, the M1's averaged 48 and 43 miles respectively, before they needed "essential maintenance." They are supposed to be able to go 101 miles.

The GAO report seems fairly optimistic that the problems will be solved, even if it takes a new engine to solve them. In the meantime, GAO wonders, why pump all that money ($2.6 million per tank) into a proven loser that will have to be modified again and again while the engineers find fixes. The Army is planning to buy 7,058 tanks for $18.6 billion. That, however, does not reflect the ultimate cost. In testimony last summer the Army told Congress that M1's will run up $27 billion in "Support costs" over their 20-year lives. (GAO Report MASAD-82-7, Dec 15)—Douglas B. Feaver.

DEPARTMENT OF THE ARMY,
OFFICE OF THE DEPUTY CHIEF OF STAFF
FOR RESEARCH, DEVELOPMENT, AND ACQUISITION,
Washington, D.C., December 22, 1981.

Mr. JOSEPH STERNE,
Baltimore Sun,
Calvert and Centre Streets, Baltimore, Md.

DEAR MR. STERNE: I have read your article of December 18, 1981 entitled "New U.S. tank engine fails often, report says". The General Accounting Office (GAO) report presents one view of the M1 tank engine problem. I wish to provide additional information which I believe will balance the story.

Tank Engine Failures: The GAO Report, which your article summarizes, says that the engine fails repeatedly and at a higher rate than the Army's goal. The Army's goal is fifty percent probablity of the power train operating for 4,000 miles without replacement of any of the three major components—engine, transmission, or final drive. It is true that power-train durability has not as yet met the Army's very stringent requirement. Engineering design changes have been incorporated into the production line. And, to insure that these changes will be adequate, the Army convened a panel of industrial, scientific, and technical leaders to independently assess

the corrections to improve M1 power-train durability. Their assessment confirmed the Army's opinion that previously identified power train failures have been corrected in production and that future durability can be expected to exceed the requirement.

It should also be noted that, even if power-train durability did not improve, a tank would require replacement of one of the three components only every four years of peacetime operation.

To allay concerns over tank combat performance, you should be aware that extensive operational testing with a tank battalion in a simulated combat scenario has demonstrated that the M1 has exceeded its combat reliability goals.

Your article implies that the above described power train problems surfaced after the Secretary of Defense decided in September 1981 to increase the M1's production rate. This is not correct. The problems and their solutions were fully considered prior to and as a part of the decision to increase M1 production.

The GAO suggests that production of the M1 be slowed to allow comparison of the turbine with a diesel engine (now under development per congressional direction). As stated in the preceding paragraphs, the turbine-equipped power train is expected to meet its stringent requirements, hence the diesel is, barring the unforeseen, not needed. And, the diesel engine is several years away from readiness for production, in part because Teledyne Continental Motors has encountered serious developmental problems. It would be unconscionable to slow the production of the urgently needed and in-production M1 tank while waiting for a decision on the diesel engine.

Cost: Your article suggests that the price of an M1 has nearly doubled since the program's inception. The M1 price has increased significantly; however, after eliminating the effects of inflation, the price we pay to Chrysler per tank is only five percent above our early forecast.

Production Goals Not Met: Like many new systems just entering production, the M1 has experienced some initial production problems. The Army has worked with the contractors to solve these problems. The last two months' production experience indicates those problems are being solved: October and Novembr production deliveries exceeded the planned rate.

The M1 tank is needed now. The Army's best efforts are directed toward rapidly producing as many high quality M1 tanks as possible. We are in production following the most extensive testing ever accomplished for an Army tank. 245 tanks have been delivered and are serving the Army well. We soldiers believe this is an outstanding tank.

The Army is always interested in providing the facts concerning its activities. I invite you to request our assistance, at any time, in providing information that may aid in presenting balanced articles to your readers.

Sincerely,

JAMES P. MALONEY,
Major General, General Staff,
Director of Weapons Systems.

[Attachment.]

[From the Baltimore Sun, Dec. 18, 1981, p. 10]

NEW U.S. TANK ENGINE FAILS OFTEN, REPORT SAYS

WASHINGTON.—A new U.S. battle tank intended to stop any Soviet armored thrust in Europe or the Middle East is plagued with an engine that fails repeatedly, according to a congressional report released yesterday.

The report by the General Accounting Office (GAO) urged that production of the heavily armed M-1 battle tank be slowed down until the problem was solved, despite the need to improve combat readiness.

"Until the engine problem is met, it appears unwise to produce large numbers of tanks," according to the report.

"Granted that improving the readiness of the armed forces demands early fielding of modernized equipment, much of the advantage of early deployment could be lost [due to] frequent failures."

In the defense appropriation bill it passed Tuesday, Congress allowed the Pentagon to obligate nearly $1.35 billion to buy 655 M-1s in the current fiscal year, an average of more than $2 million a vehicle.

The Army hopes eventually to field more than 7,000 of the tanks at a projected total cost of $18.6 billion—a price nearly double the figure given at the program's inception a decade ago.

Defense Secretary Caspar W. Weinberger approved stepped-up production of the M-1 in September after a group of experts predicted the engine performance would improve.

But the GAO said a "problem of great concern" was revealed in the latest series of M-1 tests.

The engines failed at a higher rate than the Army's goal and performed even more poorly than in 1979 tests, which prompted a flurry of efforts in improve the engines.

The Army wants at least half the M-1s to travel at least 4,000 miles without major engine repairs.

But in the recent tests, the engines showed only a "37 percent probability of meeting the requirement to achieve 4,000 miles," according to the GAO.

Because of congressional concerns over the durability problem, the Army contracted with Teledyne Continental Motors, of Muskegon, Mich., to develop an alternative diesel engine. The GAO said officials should give it serious consideration despite problems that have cropped up in tests performed thus far.

The M-1 is produced by a division of Chrysler Corporation, and until recently Chrysler was not meeting its production quota of 30 tanks a month, the report said.

DEPARTMENT OF THE ARMY,
OFFICE OF THE DEPUTY CHIEF OF STAFF
FOR RESEARCH, DEVELOPMENT, AND ACQUISITION,
Washington, D.C., December 8, 1981.

Mr. MAXWELL MCCROHON,
Chicago Tribune,
435 North Michigan Avenue, Chicago, Ill.

DEAR MR. MCCROHON: I have read your article of December 7, entitled "Is Army on the wrong track with its new tank?" I am dismayed. The article is inaccurate in many details, misleading in others, and is generally misrepresentative of the capabilities and proven performance of the M1 Abrams tank.

It is distressing to me that you would publish such a biased article. The article will at best mislead your readers and at worst create mischief for an important Army program. Such an article defames the best tank ever provided to the U.S. Army.

In the interest of correcting the record, let me provide the facts:

Cost: Your article says the M1 tank costs $30 million per copy. This is false. The Army recently purchased M1 tanks for $1.7 million each.

Tank too heavy: You state that the tank is too heavy "* * * to cross the bridges of Europe." This is not true. The 60 ton M1 Abrams tank can cross the vast majority of the highway bridges in Europe, and is in fact lighter in weight than the German Leopard 2 and British Chieftain tanks. The M1 tank is transportable by rail, heavy equipment transporters, C5A aircraft, and ocean cargo vessels.

Maintenance ratios: You state that 40 minutes (0.7 hours) of maintenance is required per hour of operation of the M60 tank, while the M1 tank requries 1.7 hours of maintenance per hour of operation. This is not correct. During recent testing of the M1 tank, the M1 maintenance ratio was comparable to that of the much older and more familiar M60 tank. As the crews and mechanics become more familiar with the new M1, the maintenance ratio will be further reduced.

15MM metric wrench: Your statement about the need for a 15mm metric wrench fails to acknowledge that every M1 tank is equipped with this wrench and has been since the program's inception. Under these circumstances, it is difficult to understand how this poses "* * * a significant maintenance burden."

Hydraulic fluid fires: You cite fire damage that has resulted from hydraulic fluid that "* * * was supposed to be fire resistance * * *", and mention that a number of Israeli tank troops were killed by hydraulic fluid burns during the 1973 Israel-Arab war. Fire retardant hydraulic fluid was adopted for use in the M60 tank as a result of 1973 war experience. The M1 tank uses the same hydraulic fluid which has a much higher flame ignition temperature that significanlty lowers the possibilities of hydraulic fluid fires in the crew compartment. Additionally, hydraulic lines and connectors have been strengthened to prevent rupture. An automatic fire detection/suppression system that uses Halon gas to smother fires detected in either the crew or engine compartments has made the M1 much more fire-safe than previous US tanks.

Excessive maintenance requirements: Your statement that the tank requires maintenance on the average of every 43 miles is misleading. The tank averages 350 miles before the occurrence of a failure affecting its ability to perform its combat

mission. Other maintenance actions are performed as time and circumstances permit, normally in conjunction with regularly scheduled maintenance services. The "43 mile" figure represents the total cumulative test mileage divided by the total number of minor and significant maintenance actions.

Vulnerability: The "defense analyst" quoted in your article has apparently offered several comments concerning the M1's vulnerability. The M1 armor has been extensively tested with live ammunition fired from many different aspects. The results of these tests are classified, therefore I will not comment on them further. The vulnerability information contained in your article, however, is not correct.

Power-train durability: Your comments on power-train durability are based on raw test data and do not take into consideration the improvements to the tank in this area. This past summer, the Army convened a panel of industrial, scientific, and technical leaders to evaluate the M1's power-train durability. In August 1981, after evaluting the existing and planned power-train corrections, this panel projected that after already designed corrections are made to the M1's power-train, the powertrain durability should meet or exceed the Army's requirement.

Brakes: As you indicate, the M1 was involved in a minor accident while being offloaded at the Sheraton Hotel (not the Shoreham Hotel) in Washington, DC for an exhibit. The brakes on the M1 tank are actuated through hydraulic pressure. Prior to moving the tank after it has been stopped for any length of time, the driver is required to run the engine until sufficient pressure has been built up to properly operate the brakes. On this occasion, the driver moved the tank before the required hydraulic pressure was established. As a result the tank rolled down an incline and collided at less than one mile per hour with a British (not a Swedish) Army truck.

Extensive testing: Several of the deficiencies cited in the article are factual, were reported during the extensive testing of the tank, and have been fixed or were judged to be of such infrequent occurrence as to constitute no appreciable problem or are so minor in nature that corrective action was not required. Evaluation of over 78,000 miles of testing indicate that the "gunner's knob coming loose", "indicator light failure", "gear case cracking", and "automatic ammunition doors closing" problems were of such infrequent occurrence that they did not present a significant operational problem.

Each incident (even those of infrequent occurrence) was evaluated to determine if further reliability or improvement could be economically achieved. For example, even though the gunner's knob was not a significant problem, retention of the knob has been improved through modification of the locking device. The problem with the automatic ammunition door that "pinches fingers" occurred only once (in early 1980). This was considered a safety hazard and subsequent modification was made in 1980 and applied to all production vehicles. There have been no recurrence of this problem.

.50 caliber machine gun mount: During the testing of the M1 tank, crews have reported problems with the Commander's Weapon Station, which includes the .50 caliber machine gun. The problem is with the location of certain controls. The Army is continuing to design a modification to the Commander's Weapon Station but believes the problem is not sufficiently serious to delay fielding of the tank.

Fuel consumption: As indicated in your article the fuel consumption of the M1 tank under certain conditions is in excess of three gallons per mile. The Army selected a turbine engine to enhance the tank's agility, thereby improving its survivability, our highest priority design consideration. To make a 60 ton tank agile requires a high horsepower engine which can be expected to use substantial amounts of fuel. While critics argue that a diesel engine uses less fuel than a turbine engine and should have been the type chosen for the tank, a diesel engine is only about fifteen per cent more fuel efficient than a comparably powered turbine engine and other critical factors such as excellent cold weather starting and low weight favored the selection of the turbine engine for the M1.

The Army is always interested in providing the facts concerning its activities. I invite you to request our assistance in the future so we may aid you in presenting balanced articles to your readers.

Sincerely,

JAMES P. MALONEY,
Major General, General Staff,
Director of Weapons Systems.

[Attachment.]

91-866 O—82——28

[From the Chicago Tribune, Dec. 7, 1981]

Is Army on the Wrong Track With Its New Tank?

(By Bill Neikirk)

Washington.—The monster tank rolled off a truck and into an exhibit hall of the Shoreham Hotel, where proud Army officers smiled at what wonders modern technology had wrought.

All was well until the soldier operating this machine put on the brakes. The tank kept going, stopping only after it had struck a Swedish military truck nearby, said a businessman who attended the trade show.

This is the XM-1 Abrams main battle tank, the turbine engine, laser-gun killer that is supposed to be the apple of the Army's eye. To many critics within and without the Pentagon, it is a lemon.

Such embarrassing breakdowns keep happening to the tank despite the Army's continued assurances that most of the flaws have been corrected. Critics say the tank is neither safe nor effective.

The XM-1 tank is criticized as a costly gas-guzzler that is too heavy to transport and to cross the bridges of Europe, with an engine so hot that it burns nearby trees and attracts heat-seeking missiles. Furthermore, it has a history of breakdowns that tarnishes its reputation as the world's fastest tank.

The tank's latest problem involves the hydraulic fluid in the system that turns the turret and other parts. In tests this year, the tank twice suffered fire damage after a high pressure hose burst.

The fluid was supposed to be fire-resistant, but that turned out to be false, according to a report obtained by The Tribune. Its burn point was 216 degrees and its flash point 425 degrees. The engine has temperatures anywhere from 900 to 1,300 degrees.

"Any conception that its (the fluid's) use makes the Abrams tank fireproof is in error," the report said. "A substitute, more fireproof fluid should be used. As an interim solution, this hose should be shielded to divert any spray away from the hot engine."

To the Defense Department analyst and consultant who asked not to be quoted by name, the fluid leakage incident meant that the tank's fire extinguisher system failed to do its job and put out the flames.

In the 1973 Israel-Arab war, he said, 300 Israeli tankers were killed because of hydraulic fluid burns. The M-60 tank—America's current main battle tank—was involved in that war, he said, but it only points out how important the fluid is.

But this is not the only problem found in the recent operational test. The report reads like an American tragedy called the Crisis of Quality:

The knob on the gunner's primary site fell off under normal use because the "snap rings holding the knob on are insufficient." For want of a knob, the gun can't be aimed.

Cables came loose in the commander's weapons panel, causing a short. Switches on the computer panel stuck. Indicator lights failed. Metal in the gear case cracked under normal use.

The final drive train must be disconnected with a 15MM metric wrench, which is not in any ordinary mechanic's tool kit. Without it, the tank can't be towed and the engine can't be pulled out.

"Since the bolts are countersunk, an adjustment wrench cannot be used," the report said. "This is a significant maintenance burden . . ."

Compared with other criticism leveled at the tank, made by the Chrysler Corp., these are minor.

Although the tank is supposed to go from zero to 50 miles per hour within a few seconds, it uses 3.3 gallons per mile. In the lastest operational testing, it went 43 miles before it had to undergo maintenance.

The defense analyst said it fails about five times as often as the M-60, and when it fails, it takes an average of nearly three hours to fix it.

The tank had an early problem of throwing its treads. But the cure turned out to be worse than the disease. The treads were tightened, increasing the gas consumption. But when the tightened treads were thrown, they went to the inside, making the final drive fall, a much more serious problem, the analyst said.

In development tests conducted over the last summer by engineers, it was found that only 21 percent of the tanks could survive 4,000 miles without an overhaul on the engine, the gear box, transmission, or final drive. The Army's required percentage was 50 percent.

At the same time, in the same test, for every hour the tank operated, it took 1.7 hours for maintenance, well above Army requirements. In an operational test conducted by mechanics, it actually took 2.9 hours for maintenance for every hour of operation.

The M–60 tank, on the other hand, requires 40 minutes for maintenance for every hour of operation.

The tests also cited several hazards, including an automatic door housing the ammunition. It seems soldiers keep getting their fingers caught in the door.

The Defense analyst said the Army is in the midst of an $800 million improvement program of the tank's armor because an unspecified round had penetrated it. "Remember, this is the magic armor that is supposed to withstand all this stuff," he said.

He said it appears the round that penetrated the armor was a more primitive type that rams through the steel by force of velocity. More modern rounds melt their way through the armor, but the M–1 has been designed to prevent that.

"The old-type hard shots are what it doesn't work against," he said.

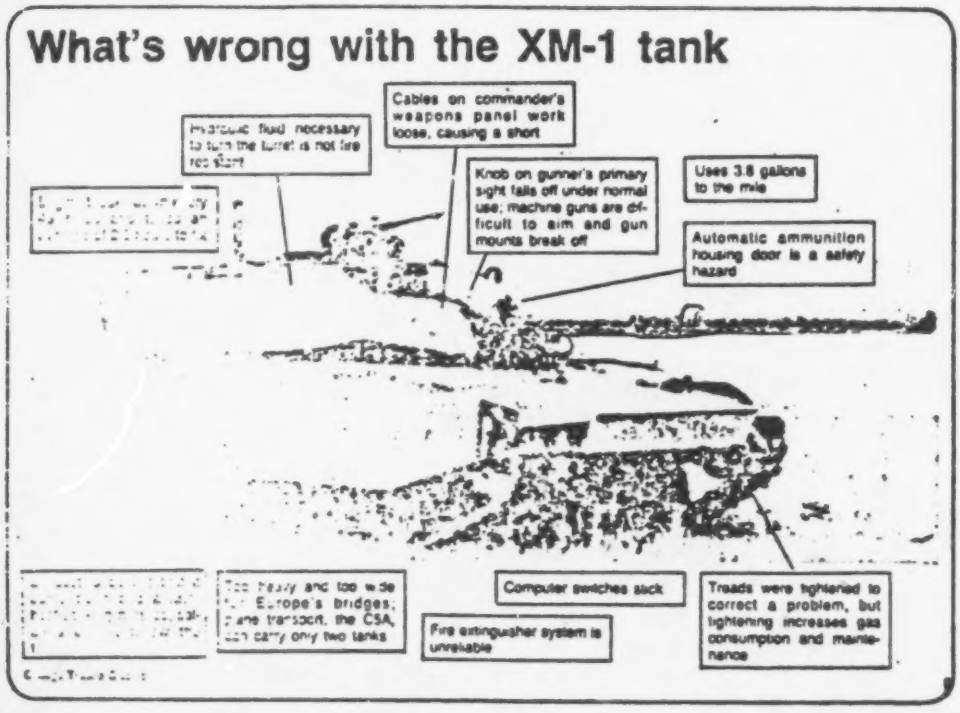
"The armor is thinner at the rear of the tank," he said. "That means that simple infantry rounds—hand-held rockets if you will—will go through the rear of the tank more easily than the M–60."

Further, he said, if the "new" armor is penetrated, it tends to crumple, and a whole panel has to be replaced. In other tanks, a hole in the armor can merely be plugged and the tank can go in its way.

The commander's 50-caliber machine gun is difficult to aim because of power control problems, the analyst said, and another machine gun is fixed in the same direction as the main gun. A third gun is mounted on a ring, he said, but "the mount keeps breaking off."

Machine-gun effectiveness is highly important to a tank, he said, because it "cleans" a battlefield of enemy soldiers who could otherwise disable it.

Critics claim that the M–1 tank has never been battle-tested in the sense that it has never been fired upon. That would be one good way to determine its effectiveness, they say. But testing the tank would be expensive. Each tank now costs nearly $30 million a copy.


What's wrong with the XM-1 tank
Cables on commander's weapons panel work loose, causing a short
Knob on gunner's primary sight falls off under normal use; machine guns are difficult to aim and gun mounts break off
Uses 3.8 gallons to the mile
Automatic ammunition housing door is a safety hazard
Computer switches stick
Treads were tightened to correct a problem, but tightening increases gas consumption and maintenance
Fire extinguisher system is unreliable

COMPARING THE EFFECTIVENESS OF CURRENT TANKS

Purpose: To respond to a presentation made by Mr. Pierre Sprey on the effectiveness of current U.S. tanks.

Facts: 1. Mr. Pierre Sprey, former OSD analyst, has presented a comparison of tank effectiveness utilizing his personally developed effectiveness measures (Inclosure 1). The evaluation attempts to compare the M1, the M60, and T62 tanks by using what he defines as "combat desired effectiveness criteria for tanks". Not only are these "effectiveness criteria" insufficient to adequately compare main battle tanks, but much of the data reported for each criterion is incorrect or misleading. An inidial evaluation of his presentation is provided below.

2. The evaluation primarily addresses the relative merits of the M1 and M60 tanks; no comments on the comparison of either US tank to the Soviet T-62 tank are made. It is generally recognized that the M60A3 and the M1 are superior to the T-62. The issue is the M1 to M60 comparison.

3. The initial chart questions what a tank is for.

a. *Allegation.*—"What is a tank for?" Infers the cannon is not the tank's main armament.

b. *Comment.*—A tank is designed for offensive action. It does this by use of its mobility, firepower, and survivability. These are the classic measures of effectiveness of tanks, documented from General Heinz Guderian in *Panzer Leader* to Richard Simpkin in *Tank Warfare.* There has been no substantive reason to temper these measures. Richard Ogorkiewicz, in his classic book, *Design and Development of Fighting Vehicles,* says of the World War II experience, "It was recognized, eventually, that guns rather than machineguns were the principal tank weapon. . . ". During the Arab-Israeli war over 85 percent of the Arab tanks killed were killed by Israeli tanks. Considering all tanks killed in the conflict at least 60 percent were killed by tank cannon fire. The main gun must hit targets accurately and be capable of killing a wide range of enemy targets from tanks and armored personnel carriers to antitank guided missile teams. The complementary weapon system, machineguns, will facilitate the main gun's ability to perform its primary mission. The mission of these weapons, however, is the area suppression of enemy soft targets.

4. The evaluation states that the following combat lessons were learned from battles in Europe, Russia, and the Mideast.

a. *Allegation.*—"Tanks are better used to attack infantry than to attack other tanks."

b. *Comment.*—Success on the battlefield requires a combination of weapons systems—a combined arms team. Tanks are more effective against infantry. Infantry are more vulnerable and less capable of killing tanks. Commander's react to such discrepancies by employing more effective weapons systems; consequently a successful tank attack against an infantry unit would be met by a tank counter-attack if they are available. Given the size of the Soviet tank force, tanks will be available. The importance assigned to the tank by our doctrine reflects the historical evidence of the effectiveness of the combined arms team.

c. *Allegation.*—"The major effect of tanks on infantry is psychological, not technical."

d. *Comment.*—The psychological shock effect of a tank attack on infantry is certainly great. However, the effect of massive, heavy caliber tank fire, mixed with machine gun fire, should not be discounted. Accounts of combat in northwest Europe are replete with examples of German tanks driving up and down US Infantry foxhole lines destroying them with main gun fire. the relative invulnerability of the tank to infantry weapons is the major component of the tank's shock effect.

e. *Allegation.*—"Tanks usually overwhelm green infantry, but rarely prevail against tank-experienced troops."

f. *Comment.*—History is replete with examples to both support and refute the allegation. In general, however, a properly planned and executed tank will prevail against even combat-experienced units.

5. The evaluation utilizes the following self-derived effectiveness criteria for tanks to make comparisons between the M1 and M60.

a. *Allegation.*—The following criteria can be used to measure the effectiveness of modern tanks: Unit Tactics/Cohesion/Training; Operational Mobility; Numbers Available on the Battlefield; Machine Gun Effectiveness; Firefight Mobility; Rate of Kill Against Multiple Tanks; and Crew Survival.

b. *Comment.*—The criteria cited in the allegation can be used to evaluate main battle tanks, but other criteria are also needed by the U.S. Army. The requirements for the M1 tank have been determined by the U.S. Army, specifically the Training and Doctrine Command, and are expressed in the M1 Materiel Need document

(MN). This document states in precise detail the requirements for the M1 tank in the following areas: Mobility, Firepower, Combat Survivability, Physical Characteristics, Reliability, Availability, and Maintainability (RAM), Human Factors Engineering, Personnel and Training considerations, and logistic supportability considerations. These requirements have a historical base but reflect current needs—not those of four decades ago. The specific comment on Machine Gun Effectiveness indicates the Tiger tank, without machine guns, was slaughtered by the Russian Infantry. The vehicle slaughtered by infantry was the Ferdinand, commonly called "Elephant", not the Tiger tank. The Ferdinand was a self propelled anti-tank gun with limited main gun traverse, missused in the battle of Kursk.

6. The evaluation develops a matrix for each of the effectiveness criteria and cites specific measures to determine how well a tank meets these criteria. Values are displayed for each measure that supposedly leads the reader to make a rational decision as to which tank better meets the criteria. Each one of the "effectiveness" criteria is listed below with the specific allegations and rejoinders. Although the MN specifies different criteria for the M1 tank, only those criteria used in the evaluation are addressed.

A. CRITERION: OPERATIONAL MOBILITY

1. Mean Miles Between Failures (MMBF).

a. *Allegation.*—M mean miles between stops for non-deferable maintenance is 34/43, 150–200 for the M60A1.

b. *Comment.*—The system reliability MMBF for the M1 is currently 126. The system reliability requirement for the M1 tank is 101 MMBF. The Army expects the M1 MMBF to further increase as the system matures. The M60A3, the product of 20 years of maturity, demonstrates a system MMBF of 108. The measure cited in the report is a rough evaluation of a recently developed parameter, Mean Miles between Essential Maintenance Demand (MMBEMD). This parameter provides a means of measuring maintenance requirements which normally would not be deferred indefinitely. A majority of the incidents counted, using this parameter, would not cause the tank to stop fighting. The Combat Mission parameter already exists for this purpose. Examples of the type incidents which are counted in the MMBEMD definition which have essentially no mission impact are, roadwheel rubber loss, semi-annual service overdue, loss of tail lights, etc. The current results for the M1 is 48 MMBEMD. This compares to the mature, less complex M60 series vehicle at 60 MMBEMD—not 150–200 as reported. The final OT/DT III results from M1 testing should indicate that the M1 is performing equal to the M60, as measured by this parameter, and will not impose a greater maintenance demand in the field. The measure is inappropriate as a measure of combat effectiveness.

2. Average sustained speed on poor roads:

a. *Allegation.*—Average sustainable speed on poor roads for the M1 is 25 mph (Fort Knox average equals 10 mph) and M60 average speed is 20 mph.

b. *Comment.*—The M1 can sustain speeds of 35–40 mph on hard-surface roads and 25–30 mph cross-country. The M1 tank has demonstrated a top governed speed of 45 mph. Average speed will be a function of many variables and will change from situation to situation. The 10 mph cited is an average speed for a combat day which includes highway, cross country and idle time; it bears no relationship to sustainable speed. The top governed speed for the M60 is 30 mph and maximum cross country speed is 14.4 mph.

3. Typical range on poor roads:

a. *Allegation.*—Typical range on poor roads for the M1 is 127 miles and 200–250 miles for the M60A1.

b. *Comment.*—The M1 tank is demonstrating a cruising range of 250 miles on dry, level secondary roads at 25 mph versus a requirement of 275 miles. The M1 has demonstrated 275 at 28–30 mph which has been accepted as meeting Army requirements (M1 road speeds exceeded 30 mph during OT III). The M60A3 with the improved RISE engine has demonstrated a cruising range of 280 miles at 20 mph on dry, paved, level roads. These are comparable "EPA"-type measurements. Comparable cross-country mileage for the M1 and M60A3 are 140 miles and 160 miles, respectively.

By Army standard operating procedure, tanks are refueled at least daily. Demonstrated operational ranges for the M1 to date are more than sufficient to insure continuous operations, even during intense combat operations. Efforts are on-going to further improve the operating range of the M1.

4. Fording Depth:

a. *Allegation.*—Fording depth for the M1 is untestable. The M60 fording depth is 1.2m.

b. *Comment.*—The fording depth for both the M1 and M60 tanks is 48" (approximately 1.2m) without special kits. During M1 pilot-vehicle testing during Development Test II (DT II), the 48" fording depth requirement was demonstrated.

5. Bridge Crossing: Combat Weight:

a. *Allegation.*—Combat weight for the M1 is 62 tons and for the M60 is 48 tons.

b. *Comment.*—The M1 combat weight is incorrect. Current weight is 60 tons. The M60A1 combat weight is 55 tons, and the M60A3 combat weight is 57 tons.

6. Tanks per Railroad Flatcar:

a. *Allegation.*—Only one M1 can fit on a standard U.S. railroad flatcar. Two M60's can fit on a standard flatcar.

b. *Comment.*—The U.S. Army railcars were built for M48's. While the M60 will physically fit two per car, the railcar is severely overloaded. On European railways most flatcars will only transport one tank of any type. To replace the old fleet, being retired by transportation authorities due to overage, the Army is procuring new flatcars for use in the Continental United States. The new cars will transport two M1's, two M60's, three IFV's, or five Ammunition Conexes.

B. CRITERION: NUMBERS AVAILABLE

1. Tanks per Billion Dollars:

a. *Allegation.*—The number of tanks that can be purchased with $1 billion is 360 M1's and 1100 M60's.

b. *Comment.*—The $2.77 million per copy ($1B/360) cited as the M1's unit cost is incorrect, and certainly misleading when compared to the 909K ($1B/1100) quoted for M60. This dollar number used for the M1 is based on the total program cost which includes the escalated dollars of the fiscal year 1983-88 procurement buys. The correct fiscal year 1983 unit hardware cost estimates—which is the only accurate estimate we have for the M60; are $1.8M for M1 and $1.3M for M60A3 ($1.0M for M60A1 at a production rate of not more than 80 per month). Thus, the correct comparison is 555 M1's per billion dollars or 769 M60A3's per billion. What is not discussed is the significant added value the country receives from the M1 in survivability, mobility, and fightability—all capabilities needed to meet the threat.

2. Peak Production Year:

a. *Allegation.*—More M60 tanks (1,200) can be produced annually than M1 tanks (720-1080).

b. *Comment.*—The numbers cited for the M1 are essentially correct. The production of M1 tanks will ramp up from an initial value of 90 per year to a sustaining value of 1,080 by fiscal year 1985; however, production capacity to produce 1,800 per year will be available. The production value cited for the M60 is the 1978 production figure when the Army had two casting facilities making turrets and hulls. With only one casting facility currently in operation, the maximum M60 production rate is 960 per year. The cost of reopening a new casting facility would significantly increase the cost of the M60.

3. Tanks surviving 4000 Miles without Power Train Replacement:

a. *Allegation.*—The percentage of vehicles surviving 4000 miles of operation without a power train overhaul is 19 percent (Jan 81 value), 22 percent (Apr 80 value), and 15 percent (July 1981 value). The M60 value is 60 percent.

b. *Comment.*—The power-train durability data presented in evaluations are based on approximately 17,000 miles of scored test results out of 35,000 miles of durability testing. Based on the number of failures encountered to date, the demonstrated durability is expected to be about .37 probability of achieving 4000 miles. A full RAM-D test, beginning in May 1982, will verify correction of the durability problems. Upon completion of this test, the power-train durability performance is expected to exceed the requirement of .5 probability. The value for the M60 tank is .79. The M60 tank power train system has been upgraded by substantial product improvement programs over the past 30 years.

4. Deadline Rate:

a. *Allegation.*—The M1 deadline rate needs troop assessment.

b. *Comment.*—The M1 has been subjected to troop testing and is now being fielded in Europe. The M1 mission capcable rate at Fort Hood approximates that of M60 units. It will continue to be assessed in Europe as M1 battalions are fielded there.

5. Average Days to Repair Combat Damage:

a. *Allegation.*—The M1 armor cannot be patched, and the engine must be shipped back to the United States for repair. The M60 can be repaired in one to two days.

b. *Comment.*—M1 armor envelope can be patched in the field by organizational level maintenance personnel. A major design feature of the M1 tank system is ease of maintenance which allows the rapid removal and replacement of the turbine engine. In a combat situation, a damaged turbine engine would be replaced, the tank returned to combat, and the damaged engine evacuated for repair. Depending on the degree of damage, the engine would be repaired at the lowest maintenance levels possible: direct support, general support, or depot level. If the Mainz Army Depot in Europe cannot repair the damaged engine, the engine will be returned to the other army depots located in the US. Unlike the diesel tank engine, the turbine engine is composed of three modules which can be swapped out for rapid (modular) repair.

C. CRITERION: MACHINE GUN EFFECTIVENESS

1. Hatch Open—Field of View (FOV):

a. *Allegation.*—With the hatch open, the tank commander on the M1 has a poor FOV while the M60 commander has a good FOV.

b. *Comment.*—There is no significant difference in FOV between the two vehicles for the commander in the hatch-open position. Both vehicles allow full 360° surveillance in this operational mode. The M1's commander's FOV is somewhat circumscribed by the gunner's sight cover and the commander's weapon station sight when viewing forward. The M60A1/A3 tank does have a slightly better FOV because The tank commander is in a higher location, providing better visibility but making an overall larger tank target. The M1 commander's weapon station was designed to provide better protection to the commander. On the M1, the commander's hatch may be positioned to provide overhead cover while approximating the field of view of open hatch operations. The Israeli Defense Forces, after the 1973 war, reported that the M60 cupola had inadequate overhead armor protection.

2. Buttoned-Up Field of View (FOV):

a. *Allegation.*—The buttoned-up FOV of the commander's weapon station (CWS) is poor in the M1 and fair in the M60.

b. *Comment.*—The buttoned-up FOV from both tanks could be rated fair to poor based on the judgment of the observer. Neither tank CWS has the degree of buttoned-up FOV required to allow the commander to exercise his command and control function as effectively as the Army would like. The M1 Commander's Weapon Station approach was designed to keep the commander's head within the heavy armor envelope. This was a result of the inadequacies of the M60 Cupola reported by the Israeli Defense Forces in 1973 (vulnerability and poor vision). Further improvement of the buttoned-up vision of the M1 Commander's Weapon Station is a high-priority product improvement for the tank.

3. Machine Gun (MG) Reliability:

a. *Allegation.*—The ammunition feed reliability of the M1's machine gun coaxially mounted with the maingun (COAX) is poor, while the M60 COAX is good. The other M1 MG's are slow or have flimsy mounts.

b. *Comment.*—Both tanks utilize the extremely reliable M240 7.62mm MG for the COAX position. Both tanks utilize a caliber .50 machine gun at the commander's weapon station. A minor problem encountered in the M1 COAX ammunition storage box feed chute capability has been corrected.

4. Instant Response of Commander's Weapon Station (CWS):

a. *Allegation.*—The instant response and aim capability of the M1 CWS is unsatisfactory while the M60 CWS response is fair. The loader's machine gun mount is flimsy.

b. *Comment.*—The M1 Powered CWS can traverse onto a target at a rate 25 percent faster than the M60 manual CWS can. Nevertheless, traversing and elevating/depressing the commander's machine gun is not as simple as desired. Design changes have been made to improve the ease with which the machine gun can be manipulated (aimed). These changes have been introduced into the M1 in the second year of production. In any case, the commander's machine gun can be aimed well enough to accurately engage targets. The loader's machine gun mount initially would work loose from the skate ring. This has been fixed in production vehicles and is no longer a problem.

5. Field of Fire for Commander's Weapon Station (CWS):

a. *Allegation.*—The field of fire of the M1 CWS is poor and fair for the M60 CWS.

b. *Comment.*—The cupola on the M60A1/A3 has a more extensive field of fire than the M1 as it allows engagement of targets throughout 360° of traverse. The M1 CWS is blocked from firing at a low angle to the left by the Loader's Weapon, and therefore covers a field of fire of approximately 270°. However, the blindspot is

easily reduced by slewing the turret to open the firing arc. Fundamentally, the field of fire is the same. The M1 loader has a machine gun to cover the commander's blindspot on the left side of the tank turret which provides better low angle fire on the left side of the tank than does the M60 Cupola. The reason for the poor and fair ratings here may be due to a belief by the authors of the evaluation that the Commander's weapon should be capable of being brought to bear on any dismounted troops in close proximity of an MBT. The COAX machine gun is designed to be employed against dismounted troops in close proximity to an MBT. The CWS has a larger caliber machine gun for employment against troops and lightly armored vehicles at ranges beyond the COAX effective range (900 meters).

6. Number of Rounds (Machine Gun):

a. *Allegation.*—None stated, machine gun ammunition considered equal.

b. *Comment.*—The M1 has 900 rounds of .50 cal ammunition and 11,400 rounds of 7.62mm. The M60 has 940 rounds of .50 cal and 5950 rounds of 7.62mm. The M1 carries almost twice the machine gun ammunition carried on the M60 tank.

D. CRITERION: FIREFIGHT MOBILITY

1. Time to Stop:

a. *Allegation.*—Not Stated.

b. *Comment.*—From Development Test II results, the M1 stops faster than the M60 (13.9 ft/sec^2 versus 11.8 ft/sec ^{2}). The M1 has demonstrated a 45-mph to 0-mph stop in 4.6 seconds. The M60 can not achieve this speed.

2. Time to "Dash" 50 Feet:

a. *Allegation.*—The M1 takes 5.0 seconds to dash 50 feet (slow due to sluggish acceleration of gas turbine and inherent slip of automatic transmission). The M60 takes 6.0 seconds.

b. *Comment.*—There is no inherent slip in the M1 transmission. The high torque of the turbine and superior power-to-weight ratio of the M1 tank make it a highly agile vehicle. In testing, the M1 accelerates from 0 to 20 mph in 5.8 seconds, while the M60A3 accelerates from 0 to 20 mph in 16 seconds. Testing has not been done for a 50 foot dash since this is not an Army requirement.

3. Trench-Crossing:

a. *Allegation.*—Both the M1 and M60 can across a 9-foot (108") trench.

b. *Comment.*—Incorrect. The M1 has a demonstrated capability of 108" while the M60 has a demonstrated capability of 102".

4. Soft Ground Capability (Ground Pressure):

a. *Allegation.*—The ground pressure of the M1 is 13 PSI causing it to sink and get stuck while the M60 ground pressure is 11 PSI.

b. *Comment.*—Ground pressure for the M1 is 13.3 PSI. The value for the M60A3 is 12.2 PSI. However, many factors enter into soft ground capability—in all comparative testing under the same conditions, the M1 has demonstrated a soft ground mobility equal to the M60A3 tank. The higher power-to-weight ratio of the M1 will allow it to power through soft ground without getting stuck, in many cases through areas the M60A3 cannot traverse.

5. Speed Maneuvering Over Rough Ground:

a. *Allegation.*—M1 is slow due to fear of throwing tread; M60 is fair.

b. *Comment.*—The M1 is vastly superior to the M60 in cross country mobility. This has been demonstrated time and again in testing to include side-by-side test with the M60. Soldiers driving the M1 have not in test, or in M1 fielded units, expressed reservations about going fast because of fear of throwing a track. Initial track throwing problems were solved in 1979 and have not recurred.

E. CRITERION: RATE OF KILL VERSUS MULTIPLE TANKS

1. Time of First Hit (100m to 1000m):

a. *Allegation.*—Both the M1 and M60 are rated GOOD, but only with battlesights; with rangefinder/fire control, time is unacceptable.

b. *Comment.*—The quoted ranges are not realistic for today's tank battles. No time is stated for what is unacceptably slow; however, in both the M1 and M60A3 tanks, trained crews normally get the first round off in less than ten seconds using the laser rangefinder and advanced fire controls. Battlesight engagements are fired faster but at the same speed for both the M60 and M1 when stationary. Both types of engagements are accomplished at speeds considered acceptable to defeat threat tanks. The M1's ability to place more rapid, accurate fire while moving cross country is a significant advantage over the M60A3.

2. Time to Subsequent Hits:

a. *Allegation.*—The M1 is fair in getting off a subsequent shot (nine seconds) while the M60 system is rated good (seven seconds). The M1 will be poorer with the 120mm cannon. Reloading is slow in the M1 due to poor loader station layout.

b. *Comment.*—Comparisons of M60A1 and M1 firepower capabilities in OT II at Fort Bliss, Texas, considered the most strenuous firepower exercises to date, demonstrated that M1 crews typically were twice as fast as M60A1 crews during simulated combat gunnery exercises. The addition of the 120mm gun system to the M1 tank should not degrade the loading time. Although the 120mm ammunition has larger diameter, its length and weight are about the same as the 105mm ammunition.

3. Percent of Hits Leading to Fire/Explosion:

a. *Allegation.*—The evaluation states that this aspect has not been tested, but probably is good (with Depleted Uranium).

b. *Comment.*—The 105mm antitank rounds have been extensively tested.

4. Sustainability: Number of Stowed Rounds:

a. *Allegation.*—The M1 has 55 stowed rounds while the M60 has 63.

b. *Comment.*—The listed numbers are correct.

F. CRITERION: CREW SURVIVAL

1. Invisibility: Turret Presented Area:

a. *Allegation.*—The M1 has the largest area of turret.

b. *Comment.*—In the definition of this measure, the evaluator cites turret presented area (square feet). From a frontal aspect, the presented areas of the M1 and M60 turret are equal, however, the M1 presents a lower profile than the M60. The side view of the M1 turret is approximately 6 percent smaller than the M60 turret. The full frontal profile area (hull and turret) of the M1 is less than that of the M60. Additionally, the advanced armor of the M1 provides greatly improved protection.

2. Infrared Signature:

a. *Allegation.*—The M1 presents a large, very visual exhaust plume while the M60 has a small plume. Soldiers walking behind the tank will be burned from exhaust. Exhaust can ignite woods.

b. *Comment.*—The M1 exhaust is hotter than the M60 exhaust, however, it has been dissipated downward and to the sides so it is less visible to infrared detection devices. The state of thermal detection technology today is such that all combat vehicles are readily detectable. There is no visible exhaust plume from the M1, while the M60 diesel engine exhibits a noticeable black plume. During tactical situations, soldiers do not walk directly behind tanks lest they get run over. Soldiers walking 5–10 feet behind the tank will not get burned, they can stand directly behind the tank when stationary at idle. There has been no problem with burning vegetation throughout the extensive testing accomplished in all types of terrain.

3. Percent Casualties Due to rocket (RPG–7) hit on side and rear:

a. *Allegation.*—This measure was not tested, the M1 probably has poorer protection than the M60 from the rear, rear side, and top, M1 hydraulic fluid is more flammable than the M60's.

b. *Comment.*—Protection afforded against the RPG–7 type of rocket has been evaluated, and the M1 meets all requirements for crew and ammunition protection. M1 protection afforded by the rear, side, and top is superior in most cases or at least equal to that of the M60 from all aspects. The M1 and M60 use the same flame retardant hydraulic fluid. This fluid is much less flammable than the hydraulic fluid previously used in the M60 and is equivalent to the hydraulic fluid adopted by the Israelis after the 1973 conflict. It is the best available at this time.

Mr. Sprey has expressed the theory that the Hot Manifold Ignition Test is the test that should be used to judge fire vulnerability. This test calls for small drops of liquid to fall on a manifold heated to 1300°F. A USAF report on Hydraulic Fluid concluded that the old hydraulic fluid "Cherry Juice" ignited at a manifold temperature of 1330°F while FRH ignited at 1250°F. In the form of liquid stream, the "Cherry Juice" ignited at 730°F while FRH ignited at 630°F. This apparent anomaly occurred because the test was conducted under a laboratory hood which provided free airflow. Under this condition, the "Cherry Juice" and JP4 aviation fuel vaporize and dissipate more rapidly and hence provide insufficient vapor to support combustion under these conditions. Using this test alone, jet fuel is less flammable than hydraulic fluid! Because no single measure permits an adequate evaluation of flammability, laboratory testing uses a matrix involving Spray Ignition tests (High and Low Pressure Spray tests) Flash and Fire Point tests, the Hot Manifold Ignition test, Auto-ignition tests, Incendiary Gun Fire tests, etc. Only after all test results are analyzed, can a determination be made as to which hydraulic fluid is least flam-

mable. In all tests, FRH propagated a fire slower and was more easily extinguishable than "Cherry Juice".

The Military Services have conducted extensive research in developing a non-flammable hydraulic fluid. However, the initial non-flammable fluids have failed to produce the required "rubber swell", thereby requiring the replacement of all rubber seals, additionally, several of the non-flammable fluids have proven to degrade tubing plastics and some metals used in combat vehicles or to produce toxic fumes when exposed to high temperatures. A new halocarbon based hydraulic fluid is being developed, and if proven successful, may be the first hydraulic fluid that does not degrade the rubber seals while being totally non-flammable. Should a totally non-flammable hydraulic fluid prove operable in our systems it will certainly be adopted for all combat vehicle use.

4. Percent Casualties Due top Cannon Hit Anywhere:

a. *Allegation.*—Stated as same as item three. The inference is that the protection levels of the M1 are poorer than the M60 protection levels.

b. *Comment.*—Over 3,500 major caliber threat rounds have been fired at M1 armor. Of these rounds, more than 500 were fired against complete ballistic vehicles, and as many as 60 of these constituted multiple hit tests. These tests demonstrated that the M1 meets the protection requirements. Due to a higher resistance to penetration and the utilization of ammunition compartmentalization in the tank, the M1 is a far more survivable tank than the M60.

5. Percent Casualties Due to Mine Detonation:

a. *Allegation.*—Not tested.

b. *Comment.*—During testing, the M1 was subjected to six attacks by heavy anti-tank mines. These tests conclusively demonstrated that the M1 meets all mine protection requirements including crew protection.

G. SUMMARY OF M1 VERSUS M60

1. Operational Mobility:

a. *Allegation.*—The M1 is operationally slower than the M60, despite good road speed, because of poor range and crippling unreliability.

b. *Comment.*—The operational range of the M1 is more than sufficient to insure continuous operation even under intense combat conditions. The durability of the power train, while not currently meeting the Army goal, is improving as the M1 tank system matures. It does not prevent the M1 from exceeding its combat mission reliability requirement of 320 mean miles between failures. Operational testing to date has shown that M1 tank units can move appreciably faster than M60 tank units and have not encountered significant durability problems during movement.

2. Numbers:

a. *Allegation.*—Procurement of the M1 tank will worsen NATO's (tank) numerical inferiority.

To buy M1 tanks is to forgo the opportunity to acquire three times as many M60 tanks.

b. *Comment.*—Economic and industrial base considerations do not permit the U.S. to produce and man more tanks than the Soviets. Therefore, the U.S. must develop a tank which is technologically superior to Soviet tanks to offset the numerical inferiority the U.S. and its allies face. Based on current hardware unit cost value, 1.4 operationally inferior M60A3's can be purchased for the price of one M1. Combat simulation studies indicate that the expected M1 combat loss rate and M1 crew loss rate are significantly lower than for the M60 tanks and crews. Therefore, significantly more M60 tanks would be needed to achieve the same combat capability of the M1 tank fleet, thereby offsetting the cost advantage of the less capable but cheaper M60 tank.

3. Machine Gun Effectiveness:

a. *Allegation.*—The M1 has poorer fields of fire.

The M1 COAX works but loader's mount breaks and commander's MG is impossible to aim.

b. *Comment.*—The M1 and M60 utilize the extremely reliable U.S. M240 7.62mm MG for the COAX position. The minor problem encountered in the early testing of the M1 COAX ammunition box feed chute has been corrected. Although the M1's CWS machine gun cannot fully traverse to the left side of the tank, the loader's station machine gun compensates for this and provides better close-in protection than does the M60 CWS. Consequently, the M1 has a 360° coverage from two machine guns at all times and can bring all three machine guns to bear in the same direction in a few seconds. Initial problems with the loader's mount have been cor-

rected. It does not break as alleged and the commander's machine gun can be aimed and fired accurately.

4. Firefight Mobility:

a. *Allegation.*—The M1 is only slightly faster in short dashes due to sluggish acceleration of gas turbine and automatic transmission.

The M1 is slower than the M60 over rough and soft ground.

b. *Comment.*—The first allegation is not true—the M1 is twice as quick as the M60 in acceleration from 0 to 20 mph. The M1, while slightly heavier than the M60, has demonstrated that it can operate in soft terrain as well as the M60; in fact, the superior power-to-weight ratio (25 hp/ton versus 13 hp/ton) allows the M1 to power through soft terrain without getting stuck. Fear of throwing a track is not a problem and does not impact on M1 mobility.

H. RATE OF KILL VERSUS TANKS

a. *Allegation.*—M1's rate of kill is slightly slower than the M60, if M60 is given the 105mm DU round. Laser fire control, if used, further slows rate of kill.

b. *Comment.*—Rate of kill is a function of many variables, to include time to fire and probability of hit. DT II test results indicate the M1 to be about twice as effective as an M60. Since the M1 and M60 fire the same main gun ammunition, the M1 retains its kill rate over the M60. Battlesight engagement will always be faster than the precision gunner solution for the M60A1, M60A3, and M1 tanks. Consequently, M1 rate of fire is at least equal to that of the M60; when accuracy of fire is considered the M1 is superior. Overlooked is the vastly superior M1 capability to accurately shoot-on-the-move which has a tremendous positive impact on M1 survivability and combat capability

I. CREW SURVIVAL

a. *Allegation.*—Mostly untested. M1 fire-extinguishing may prove a step forward. Flammable hydraulics are a major minus. Protection against side/rear infantry rocket (or cannon) attack appears to be poorer than the M60.

b. *Comment.*—The armor protection and crew survivability of the M1 have been extensively tested to include effectiveness of the fire detection/suppression system. The M1 fire detection/suppression system and the use of flame-retardant hydraulic fluid significantly improve crew survivability. Testing of the M1 has demonstrated that due to a higher resistance to penetration and the utilization of fuel and ammunition compartmentalization, M1 survivability is far superior to the M60. The M1's armor protecton offers the best protection against all antitank rounds and is significantly better than the M60's armor protection.

J. OVERVIEW

a. *Allegation.*—Is one M1 better than three M60's? Is one M1 better than one M60?

b. *Comment.*—From a cost basis, one M1 costs as much as 1.4 M60A3 tanks. The M1 is demonstratably faster, more agile, and more maneuverable than the M60. The M1 is more capable at firing on the move than M60 tank. From a crew survivability aspect, the M1 is the most survivable tank in the world today. If equivalent combat power is utilized as a measure, the M60 would be more expensive since it is much more vulnerable to enemy antitank rounds.

c. *Allegation.*—Only live-firing troop tests of mobility, rate of kill and crew survivability, using the M1 side-by-side with the M60, can answer these questions.

d. *Comment.*—During DT/OT II, extensive side-by-side testing was conducted. The M1 proved to be superior in every case. Live fire survivability testing of the M1 was compared with the M60 historical data. The M1 is clearly superior to the M60. During the current DT/OT III testing, the major issue was no longer a comparison between the M60 and M1, but rather the design maturity of the production model M1 tank. However, the troops in the M1 battalion at Fort Hood and Europe are very enthusiastic about the mobility, firepower, and survivability of the M1 tank; as a result they have great confidence in their ability to fight a numerically larger enemy tank force and win.

e. *Allegation.*—Only side-by-side testing can ensure correction of the M1's most serious deficiencies.

f. *Comment.*—A major objective of the Army's testing of the M1 tank continues to be the identification of deficiencies (with regard to the MN requirements) and demonstration of fixes through testing of the changes. The Office of the Program Manager, M1 Tank Systems, keeps track of all identified deficiencies and the subsequent

changes and testing of changes to correct those deficiencies. Side-by-side testings would not significantly contribute towards demonstrating fixes to either tank.

K. PRODUCTION GRAPH

The report presents a graph that reflects, on an annual basis, a decrease in Soviet production and an increase in U.S. production of tanks in recent years.

a. *Allegation.*—"Is there a Soviet Armor Buildup?" "or is U.S. armor inferiority a self inflicted wound?"

b. *Comment.*—This chart is based upon annual rates. A chart reflecting production on a cumulative basis would be more revealing. A restructured graph would reflect a continuously widening gap between U.S. tanks and Soviet tanks available for use. The fact remains that U.S. forces currently have slightly less than 11,000 tanks while the Soviets have more than 45,000, a better than four to one numeric advantage.

L. FUTURE TANK PROPOSALS

The last two charts of Mr. Sprey's presentation outline his approach to what the Army should have as a tank to defeat the T-72.

a. *Allegation.*—By inference the M1 is not an appropriate vehicle for the U.S. Army.

b. *Comment.*—The logic is aesthetically pleasing. It presents, however, several dichotomous situations. The best survivability, weight, cost, and combat effectiveness considerations all interact—normally each to the detriment of at least one other parameter. For example:

(1) Diehl track—could be put on the M1 tank and would increase track life but would weigh 1.5 tons more than current M1 tanks.

(2) Additional protection for the rear of armored vehicles also increases weight.

(3) Non-flammable hydraulic fluid that will work in combat systems has been a long standing requirement of all services. The currently referenced BRACO is nothing more than FRH with a rust inhibitor added. Freon 86.5 is an experimental fluid, proprietary in nature, that should work but costs $475 per gallon. The military service laboratories have a much cheaper experimental non-flammable fluid that will begin test this year.

(4) Finally, the unit program cost proposed in the study appears totally unrealistic in light of today's economic climate.

SUMMARY

1. The analysis allegedly shows that the M1's operational performance is substandard. The analysis is based on M1 pilot vehicle testing conducted during 1979, and historical references that are, in many cases, no longer applicable.

The analysis compares the M60 RAM performance (after 20 years of maturity) with the pilot vehicle M1's RAM performance during testing. The significant pilot vehicle problems have been solved and, except for track and power-train durability, the M1 tank is meeting all stated performance requirements. Track durability will not meet the requirement unless there is a breakthrough in rubber compound technology. Power-train durability is improving with quality control improvements, and fixes for identified problems which have been placed in production. Follow-on testing is planned for May 1982. The Army is confident that a powertrain durability will prove to be satisfactory. The authors of the analysis did not address major M1 survivability advantages. They did not consider the M1's special armor, compartmentalization of both fuel and ammunition, flame retardant hydraulic fluid, and automatic fire detection/suppression system.

2. The analysis states that three M60's can be purchased for the same dollar amount as one M1. Based on current acquisition costs, only 1.4 new M60A tanks could be procured for the cost of one M1.

3. Presently, the bulk of the U.S. tank fleet consists of M60 series tanks. While the M60 was a superior system during the 1960's, recent introductions of more capable Soviet tanks have challenged U.S. technology to keep pace by improving the M60. Currently, the latest Soviet main battle tanks are superior to the M60. The M1 tank offers significant improvements over the M60 tank family. The M1 mobility far overshadows that of the M60 in that it accelerates faster, moves faster on roads and cross country, and can negotiate rough terrains more easily than the M60. The M1's demonstrated ability to engage and kill targets is superior to that of the M60. Survivability and crew protection are major features of the M1 tank and represent a significant improvement over the M60 tank. The M1 is a far more capable tank that

will not only fight and survive better, but will also allow U.S. armored units to fight a numerically superior force and win.

4. Like the U.S. Army, the Soviets organize and fight in combined arms teams; however, they can field these teams in greater quantities and with systems of comparable quality to the current U.S. systems. The task of fighting in Central Europe without the M1 tank would place the United States in the position of fighting the vastly superior Soviet tank fleet with less capable M60 tanks.

Given the quality shortfall of the M60 as compared to the T64 and T72 tanks, the United States might consider an option to simply proliferate the battlefield with a greater number of tank systems with which to counter Soviet forces. It is apparent, however, that current economic and industrial base considerations will not allow the United States to produce nor man more main battle tanks than the Soviets. While advancements have been made in all systems which make up the combined arms team, the importance of the tank as the focus around which the other elements of the team function has not been overcome by history. The M1 tank provides new dimensions in firepower, survivability, and mobility to execute the missions required of the combined arms team.

5. The tank is the backbone of the combined arms teams and therefore has a high priority for rapid fielding. To not do so would be a disservice to the citizens who depend on the Army for the nation's defense and to the U.S. soldier who must fight in the tank in the defense of the country.

COMPARING THE EFFECTIVENESS OF CURRENT TANKS

WHAT IS A TANK FOR?

- TO FIGHT OTHER TANKS (U.S. ARMY)

- TO BRING MACHINEGUNS TO BEAR ON THE ENEMY'S UNPROTECTED REAR, USING SPEED AND SURPRISE (GENERAL GEORGE PATTON).

INSIGHT: IS THE CANNON THE TANK'S MAIN ARMAMENT?

SOME LESSONS OF COMBAT IN EUROPE, RUSSIA, AND THE MIDEAST

- TANKS ARE BETTER USED TO ATTACK INFANTRY THAN OTHER TANKS
- THE MAJOR EFFECT OF TANKS ON INFANTRY IS PSYCHOLOGICAL, NOT PHYSICAL (I.E., MORAL, NOT MATERIAL) - BUT ONLY WHEN USED IN MASS
- TANKS USUALLY OVERWHELM GREEN INFANTRY, BUT RARELY PREVAIL AGAINST TANK-EXPERIENCED TROOPS

COMBAT-DERIVED EFFECTIVENESS CRITERIA FOR TANKS

I	UNIT TACTICS/ COHESION/ TRAINING	4,000 TECHNICALLY INFERIOR GERMAN TANKS ADVANCED 1,000 MILES IN 3 MONTHS AGAINST 23,000 RUSSIAN TANKS
	OPERATIONAL MOBILITY	TIME TO MOVE A TANK COLUMN FROM BIVOUAC TO OBJECTIVE (E.G., 50 MILES OVER DIRT ROADS)
II	NUMBERS AVAILABLE ON THE BATTLEFIELD	TANKS BROUGHT TO BEAR, EXCLUDING THOSE UNAVAILABLE DUE TO BREAKDOWN, REPAIR OF COMBAT DAMAGE, OR LENGHTY CREW TRAINING
	MACHINEGUN EFFECTIVENESS	ABILITY TO PUT BURSTS ON SURPRISE TARGETS RELIABLY, QUICKLY AND SUSTAINABLY (TIGERS WITHOUT MGs WERE SLAUGHTERED BY RUSSIAN INFANTRY)
III	FIREFIGHT MOBILITY	TIME FROM SURPRISE ATTACK (USUALLY ON ROAD) TO REACHING OFF-ROAD COVER AND ENVELOPING OR BYPASSING ATTACKER
	RATE OF KILL AGAINST MULTIPLE TANKS	TIME FROM DETECTION TO DESTRUCTION OF ANY ENEMY PLATOON (E.G., 3 TANKS) OR LARGER UNIT.
	CREW SURVIVAL: • VS. INFANTRY • VS. TANKS	ABSENCE OF FIRE, BLAST, OR FRAGMENT CASUALTIES (INCLUDING FROM ON-BOARD HYDRAULICS, FUEL, AMMO, OR INADEQUATE ESCAPE PROVISIONS) DUE TO: • SIDE/REAR ROCKET ATTACK • MINE UNDER TRACK • 360° CANNON ATTACK

COMBAT-DERIVED EFFECTIVENESS CRITERIA: OPERATIONAL MOBILITY		
DESIRED EFFECT	NECESSARY EFFECTIVENESS CHARACTERISTICS	MEASURE
MOVE A TANK COLUMN FROM FRIENDLY REAR TO ENEMY REAR FASTER THAN THE ENEMY CAN REACT	RELIABILITY UNDER BATTLE CONDITIONS	• MILES BETWEEN FAILURES REQUIRING IMMEDIATE MAINTENANCE
	GOOD AVERAGE (NOT MAX) ROAD SPEED -- INCLUDING STOPS FOR REPAIR AND FUEL	• AVERAGE SUSTAINABLE SPEED OVER POOR ROADS
	ABILITY TO OPERATE A DAY OR TWO WITHOUT TANKER TRUCK SUPPORT	• ROAD RANGE AT ABOVE SPEED • OVERWATCH ENDURANCE
	ABILITY TO WADE RIVERS AND CROSS LOW CAPACITY BRIDGES	• WADING DEPTH • COMBAT WEIGHT

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COMPARATIVE EVALUATION: OPERATIONAL MOBILITY			
MEASURE	XM-1	M-60 A1	T-62
MILES BETWEEN STOPS FOR NON-DEFERABLE MAINTENANCE	34[1] (OT II) 43[1] (OT III)	150-200	100-125
HOURS PER STOP	2.6 (OT II, III)		
AVERAGE SUSTAINABLE SPEED ON POOR ROAD	25 MPH[2]	20 MPH	15 MPH
TYPICAL RANGE ON POOR ROADS	127 MI (FORT KNOX)	175-250 MI	150-200 MI (WITH EXTERNAL FUEL)
FORDING DEPTH	UNTESTABLE DUE TO LEAKS	1.2m	1.4m
BRIDGE CROSSING: COMBAT WEIGHT	62 TONS	48 TONS (M-60) GREW TO 57 TONS (A3)	44 TONS
TANKS PER RR FLATCAR (U.S.)	1	2	

[1] OT II TEST DIRECTOR'S SCORING OF FAILURES REQUIRING IMMEDIATE MAINTENANCE.

[2] OT II AND III CONDUCTED AT AN ACTUAL AVERAGE OF 10 MPH.

COMBAT-DERIVED EFFECTIVENESS CRITERIA: NUMBERS OF TANKS AVAILABLE		
DESIRED EFFECT	NECESSARY EFFECTIVENESS CHARACTERISTICS	MEASURE
	• BE ABLE TO OUTPRODUCE ENEMY IN TANKS IN PEACETIME	• TANKS PER BILLION $ OF PROCUREMENT
TEAR APART ENEMY'S ORGANIZATION WITH MULTIPLE TANK THRUSTS	• BE ABLE TO OUTPRODUCE ENEMY IN WARTIME	• SURGE PRODUCTION RATE
	• HAVE LARGE PERCENTAGE OF INVENTORY READY FOR COMBAT	• DEADLINE RATE (%) IN TROOP USE
	• BRING LARGE PERCENTAGE TO BEAR AT THE FRONT	• PERCENT SURVIVING 200 MILE FORCED MARCH
	• MINIMIZE PERCENTAGE IN PIPELINE FOR REPAIR OF COMBAT DAMAGE	• AVERAGE DAYS TO REPAIR COMBAT DAMAGE

COMPARATIVE EVALUATION: NUMBERS AVAILABLE			
MEASURE	XM-1	M-60	T-62
TANKS PER BILLION $	360	1,100	1,500
PEAK PRODUCTION PER YEAR (PEACE)	720 - 1,080	1,240	2,000-3,000*
% SURVIVING 4000 MILES WITHOUT POWERTRAIN OVERHAUL	22% (APR 80) 19% (JAN 81) 15% (JUL 81)	60%	0%
OPERATIONAL AVAILABILITY	43 - 47% (OT II, III)	85%	
AVERAGE DAYS TO REPAIR COMBAT DAMAGE	• Armour can't be repaired below depot • Damaged engines to CONUS	1-2 days (Israelis-73)	

*All Models of Medium Tanks.

COMBAT-DERIVED EFFECTIVENESS CRITERIA: MACHINEGUN EFFECTIVENESS		
DESIRED EFFECT	NECESSARY EFFECTIVENESS CHARACTERISTICS	MEASURE
PLACE BURST INSTANTLY ON ANY INFANTRY ANTITANK THREAT -- EVEN AS CLOSE AS ROADSIDE DITCH	UNOBSTRUCTED VIEW OF THREATS	• HATCH-OPEN FIELD OF VIEW • BUTTONED-UP FIELD OF VIEW
	MG RELIABILITY	• BURSTS BETWEEN JAMS
	NEARLY INSTANT RESPONSE	• FREE MOUNT VS. SLOWER CUPOLA OR TURRET
	ABILITY TO FIRE CLOSE-IN AT ANY AZIMUTH	• FIELD OF FIRE DIAGRAM • NUMBER OF INDEPENDENT MG'S
	ABILITY TO SUSTAIN FIRE FOR EXTENDED FIREFIGHTS	• NUMBER OF READY ROUNDS • TOTAL ROUNDS ON-BOARD

COMPARATIVE EVALUATION: MACHINEGUN EFFECTIVENESS

MEASURE		XM-1	M-60	T-62
HATCH-OPEN FIELD OF VIEW		POOR (WIDE, FLAT TURRET)	GOOD	GOOD
BUTTONED-UP FIELD OF VIEW		POOR	FAIR	POOR
MG RELIABILITY/ FAST RESPONSE	COAX	UNRELIABLE FEED (FIXED?)	GOOD* (M240)	GOOD
	CDR	SLOW/NOT AIMABLE	JAMS (M85)	GOOD
	LDR	GOOD MG/FLIMSY MOUNT	N/A	N/A
FIELD OF FIRE		CDR = POOR	CDR = FAIR	CDR = FAIR
NUMBER OF ROUNDS		.50 CAL = 1000 rds. 7.62 mm = 600 rds.	.50 CAL = 1000 rds. 7.62 mm = 6000 rds.	12.7 mm = 500 rds 7.62 mm = 2,000 rds.

* M73 MG ON M-60/M60A1 IS UNUSABLE.

COMBAT-DERIVED EFFECTIVENESS CRITERIA: FIREFIGHT MOBILITY		
DESIRED EFFECT	NECESSARY EFFECTIVENESS CHARACTERISTICS	MEASURE
MOVE QUICKLY FROM ON-ROAD EXPOSURE TO OFF-ROAD COVER IN ORDER TO ATTACK OR BYPASS THREAT	LEAVE ROAD QUICKLY THROUGH DITCHES, HEDGES, OR STONE WALLS	• TIME TO STOP FROM COLUMN SPEED • TRENCH-CROSSING DISTANCE • TIME TO "DASH" 50 FEET
	TRAVERSE MUD WITHOUT BOGGING	• SIDE-BY-SIDE TEST • GROUND PRESSURE (POOR SURROGATE)
	TRAVERSE ROUGH GROUND QUICKLY	• SIDE-BY-SIDE TEST • SUSPENSION TRAVEL (SURROGATE)

COMPARATIVE EVALUATION: FIREFIGHT MOBILITY			
MEASURE	XM-1	M-60	T-62
TIME TO STOP			
TIME TO "DASH" 50 FEET	5 SEC*	6 SEC	5.5 SEC
TRENCH-CROSSING	9 FT	9 FT	9 FT
SOFT-GROUND CAPABILITY: GROUND PRESSURE	13 PSI	.11 PSI	10 PSI
SPEED MANEUVERING OVER ROUGH GROUND:	SLOW (DUE TO FEAR OF THROWING TREAD)	FAIR	SLOW (DUE TO HARSH SUSPENSION AND TREAD THROWING)

*SLOW DUE TO SLUGGISH ACCEL OF GAS TURBINE AND INHERENT SLIP OF AUTOMATIC TRANSMISSION

COMBAT-DERIVED EFFECTIVENESS CRITERIA: RATE OF KILL VS. MULTIPLE TANKS		
DESIRED EFFECT	NECESSARY EFFECTIVENESS CHARACTERISTICS	MEASURE
MINIMIZE TIME FROM DETECTION TO DESTRUCTION OF AN ENEMY TANK PLATOON	• QUICK TURRET TRAVERSE AND INSTANT RANGING/ AIMING	• TIME TO FIRST HIT FROM SURPRISE ENCOUNTER AT TYPICAL COMBAT RANGES.[1] (TROOP FIRINGS)
	• QUICK RELOADING AND RE-LAYING	• TIME TO SUBSEQUENT HITS
	• NEAR-CERTAINTY OF "BREWING" UP A TANK FOR EACH HIT	• PERCENT OF HITS RESULTING IN A BURNING TANK (USE ONLY LIVE FIRING RESULTS AGAINST COMBAT-LOADED TANKS)
	• ABILITY TO SUSTAIN FIRE	• NUMBER OF ROUNDS ON-BOARD

[1] DOCUMENTED TANK ENGAGEMENT RANGES ARE:

- EUROPE: 50% WITHIN 500 M; 10% BEYOND 1000 M
- NORTH AFRICA: 50% WITHIN 750 M; 10% BEYOND 1500 M
- ISRAEL: 300 M to 800 M

MAXIMUM POSSIBLE RANGES FROM NATO TERRAIN INTERVISIBILITY MEASUREMENTS ARE:

- CENTRAL EUROPE: 50% WITHIN 550 M; 15% BEYOND 1000 M

COMPARATIVE EVALUATION: RATE OF KILL VS MULTIPLE TANKS			
MEASURE	XM-1	M-60	T-62
TIME TO FIRST HIT (100M TO 1000M)	GOOD*	GOOD*	FAIR (SLOW TURRET INACCURATE ROUND)
TIME TO SUBSEQUENT HITS	FAIR** (~9 SECS)	GOOD (7 SECS)	VERY SLOW (15+ SECS)
% OF HITS LEADING TO FIRE/ EXPLOSION	NOT TESTED: PROBABLY GOOD (WITH DU)	NOT TESTED: PROBABLY GOOD (WITH DU)	NOT TESTED: PROBABLY POOR TO FAIR
SUSTAINABILITY: NUMBER OF STOWED ROUNDS	55 (40 WITH 120 MM)	63	40

**WILL BE POORER WITH 120MM CANNON AND UNRELIABILITY OF CASELESS ROUND. RELOADING IS SLOW DUE TO POOR LOADER'S STATION LAYOUT.

*ONLY WITH BATTLESIGHTS; WITH RANGEFINDER/FIRE CONTROL, TIME IS UNACCEPTABLY SLOW.

COMBAT-DERIVED EFFECTIVENESS CRITERIA: CREW SURVIVAL		
DESIRED EFFECT	NECESSARY EFFECTIVENESS CHARACTERISTICS	MEASURE
MINIMIZE CREW CASUALTIES DUE TO HITS	INVISIBILITY	• HEIGHT • PRESENTED AREA IN FT^2 (PARTICULARLY FOR TURRET IN DEFILADE) • STRENGTH OF INFRARED SIGNATURE • NOISINESS
	REDUCE FRAGMENT SPRAY AND AMMO/FUEL/HYDRAULICS FIRES CAUSED BY ROCKET (E.G., RPG-7) HITS ON SIDE AND REAR	• % FIRES AND FRAGMENT CASUALTIES FROM LIVE FIRINGS AGAINST COMBAT-LOADED TANKS
	SAME FOR AP, HEP, AND HEAT SOVIET TANK ROUNDS FROM FRONT, SIDE, AND REAR	• SAME • SAME FOR MULTIPLE HITS BY AP AND HEP
	REDUCE BLAST AND FRAGMENT EFFECT FROM STANDARD SOVIET MINES	• % BLAST OF FRAGMENT CASUALTIES FROM LIVE MINE DETONATION • % SERIOUS IMMOBILIZATION (BEYOND TRACK DAMAGE)

COMPARATIVE EVALUATION: CREW SURVIVAL			
MEASURE	XM-1	M-60	T-62
INVISIBILITY: TURRET PRESENTED AREA	POOR (WITH HIGHLY VISIBLE PROFILE)	FAIR	FAIR
INVISIBILITY: INFRARED SIGNATURE	LARGE, VERY VISIBLE EXHAUST PLUME CAN IGNITE WOODS	SMALL	SMALL
% CASUALTIES DUE TO ROCKET (RPG-7) HIT ON SIDE/REAR	NOT TESTED: PROBABLY POORER THAN M-60 FROM REAR 180°; MORE FLAMABLE HYDRAULICS THAN M-60	NOT TESTED: HIGH BURN CASUALTIES IN ISREALI WAR-FLAMMABLE HYDRAULICS	NOT TESTED: LIKELY TO BE MUCH POORER THAN M-60
% CASUALTIES DUE TO CANNON HIT ANYWHERE	SAME AS ABOVE	SAME AS ABOVE	SAME AS ABOVE
% CASUALTIES DUE TO MINE DETONATION	NOT TESTED	NOT TESTED	NOT TESTED

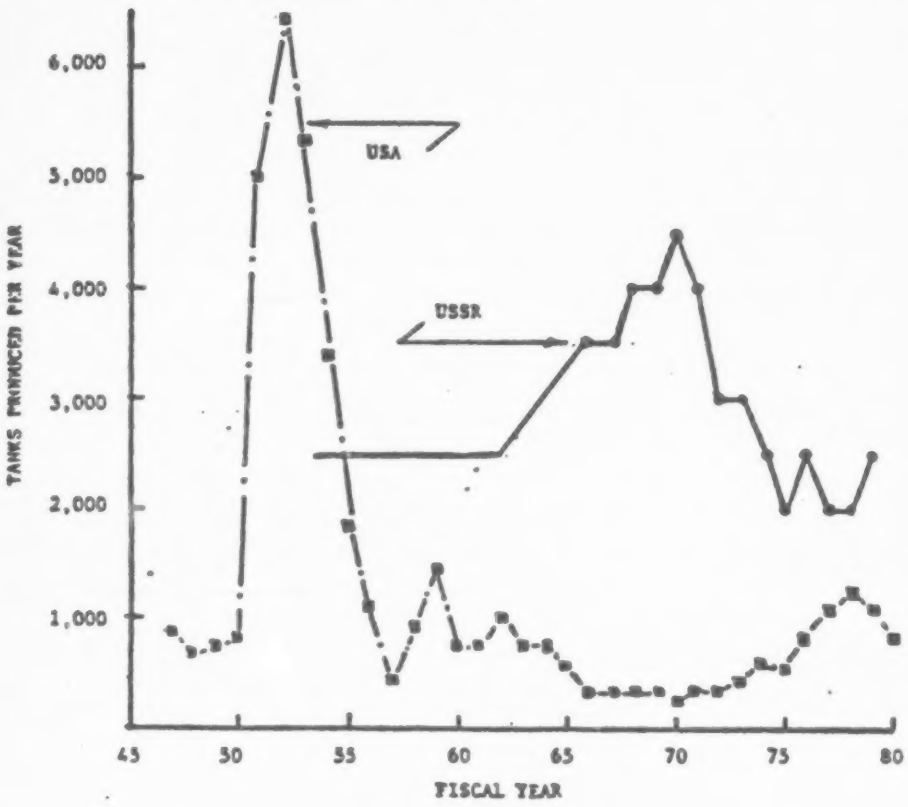
SUMMARY OF XM-1 VS M-60	
OPERATIONAL MOBILITY	XM-1 IS OPERATIONALLY SLOWER THAN M-60 DESPITE GOOD ROAD SPEED, BECAUSE OF POOR RANGE AND CRIPPLING UNRELIABILITY.
NUMBERS	• XM-1 WILL WORSEN NATO'S NUMERICAL INFERIORITY. • TO BUY XM-1 IS TO FOREGO THE OPPORTUNITY TO ACQUIRE 3 TIMES AS MANY TANKS.
MG EFFECTIVENESS	• XM-1 HAS POORER MG FIELDS OF FIRE. • XM-1 COAX WORKS; LOADER'S MG MOUNT BREAKS: COMMANDER'S MG IS "IMPOSSIBLE TO AIM".
FIREFIGHT MOBILITY	• XM-1 ONLY SLIGHTLY FASTER IN SHORT DASHES DUE TO SLUGGISH ACCELERATION OF GAS TURBINE AND AUTOMATIC TRANSMISSION. • XM-1 SLIGHTLY POORER THAN M-60 OVER SOFT GROUND. • XM-1 SLOWER OVER ROUGH GROUND (FEAR OF THROWING TREAD)
RATE OF KILL VS TANKS	• XM-1's RATE OF KILL IS SLIGHTLY SLOWER THAN M-60 IF M-60 IS GIVEN THE 105 MM DU ROUND. • LASER FIRE CONTROL, IF USED, FURTHER SLOWS RATE OF KILL.
CREW SURVIVAL	MOSTLY UNTESTED. XM-1 FIRE EXTINGUISHING MAY PROVE A STEP FORWARD (IF FIXED). HYDRAULIC FLUID MORE FLAMMABLE THAN M-60. PROTECTION AGAINST SIDE/REAR INFANTRY ROCKET (OR CANNON) ATTACKS APPEARS TO BE POORER THAN M-60. KE ROUNDS PENETRATE CHOBHAM ARMOR EASILY.

OVERVIEW

- IS ONE XM-1 BETTER THAN THREE M-60S?
- IS ONE XM-1 BETTER THAN ONE M-60?

- ONLY LIVE-FIRING TROOP TESTS OF MOBILITY, RATE OF KILL AND CREW SURVIVAL, USING THE XM-1 SIDE-BY-SIDE WITH THE M-60, CAN ANSWER THESE QUESTIONS.
- ONLY SIDE-BY-SIDE TESTING CAN ENSURE CORRECTION OF THE XM-1'S MOST SERIOUS DEFICIENCIES.

IS THERE A SOVIET
ARMOR BUILDUP?



OR IS U.S. ARMOR INFERIORITY
A SELF-INFLICTED WOUND?

A FEASIBLE TANK TO OUTFIGHT AND OUTNUMBER THE T-72	
MOBILITY	• 45 TONS • 1000-1200 HP DIESEL (AVAILABLE) • DIEHL TRACK, REPLACEABLE PADS • 7 WHEELS/5 SHOCKS/300 MM TRAVEL • 5 SPEED SYNCHROMESH GEARBOX • FUEL FOR TWO COMBAT DAYS
TURRET	• MERKAVA MINIMUM PROFILE TURRET • FIXED COMMANDER'S STATION • DESIGN FOR HATCH-OPEN FIGHTABILITY
MACHINEGUNS	• 7.62 COAX PLUS TWO 5.56 MM FREE MGs • 12,000 RDS FOR MGs
CANNON	• 75 MM TO 90 MM DU @ 6,000 FPS (STONER) • 85 RDS STOWAGE • COULD ACCEPT 105 MM DU • BATTLESIGHT PLUS NON-COUPLED LASER

A FEASIBLE TANK TO OUTFIGHT AND OUTNUMBER THE T-72 (CONT'D)	
CREW SURVIVAL	• SIDE/REAR FULLY PROTECTED AGAINST 12.7 MM AP AND RPG-7 (USING STANDOFF PLATES/ SKIRTS) • ANTI-SPALL LINER • ENGINE IN FRONT • ZERO SMOKE (AFTERBURNER) • MINIMUM INTERNAL FUEL (FOAM); JETTISONABLE EXTERNAL FUEL (SELF-SEALING) • NO AMMO IN TURRET; LOW SENSITIVITY AMMO, POSSIBLY IN WATER BATH • ZERO FLAMMABILITY HYDRAULIC FLUID (E.G., BRAYCO OR FREON) • AUTO FIRE EXTINGUISHERS • LAYOUT FOR ZERO MINE CASUALTIES • ALL FEATURES TESTED W/SOVIET AMMO VERSUS COMBAT-LOADED TEST TANKS
NUMBERS	• UNIT PROGRAM $ = $800,000 • PRODUCTION RATE = 2500/YR • TWO COMPETING PRODUCERS • SURGE PRODUCTION = 5000/YR • ANNUAL BUDGET = $2B (SAME AS M-1)

END RESULT
• CRUSHING SUPERIORITY OVER THE T-72 • MOVE FASTER AND KILL FASTER THAN THE M-1 WITH LESS CREW CASUALTIES • TRIPLE THE U.S. TANK PRODUCTION WITHIN SAME BUDGET

Senator HUMPHREY. The subcommittee is adjourned.
[Whereupon, at 11:30 a.m., the subcommittee adjourned.]

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DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

TUESDAY, MARCH 9, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

NAVY TACTICAL AIR PROGRAMS

The subcommittee met, in executive session, pursuant to notice at 8:57 a.m., in room 212, Russell Senate Office Building, Senator Barry Goldwater, (chairman) presiding.

Present: Senators Goldwater and Warner.

Staff present: L. Wayne Arny III, Robert S. Dotson, George K. Johnson, Jr., José E. Martinez, and Carl M. Smith, professional staff members: and Tamara L. Jones, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Buzz Hefti, assistant to Senator Warner; Jon Etherton, assistant to Senator Jepsen; Frank Krebs, assistant to Senator Cannon; and Gray Armistead, assistant to Senator Byrd.

OPENING STATEMENT BY SENATOR BARRY GOLDWATER, CHAIRMAN

Senator GOLDWATER. Today the Tactical Warfare Subcommittee meets to receive testimony on Navy tactical air programs.

The subcommittee welcomes Mr. Melvyn Paisley, Assistant Secretary of the Navy for Research, Engineering and Systems; Vice Adm. Wesley L. McDonald, Deputy Chief of Naval Operations for Air Warfare; and Lt. Gen. William J. White, Deputy Chief of Staff for Marine Aviation.

The subcommittee will expect to receive highlights of the Navy's fiscal year 1983 budget request with particular attention devoted to the issue of cost growth.

I also ask that you make clear to us any technical problems you may be encountering in either development of production programs.

Gentlemen, we welcome you. You may proceed as you wish.

STATEMENT OF HON. MELVIN R. PAISLEY, ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, ENGINEERING AND SYSTEMS, ACCOMPANIED BY VICE ADM. WESLEY L. McDONALD, USN, DEPUTY CHIEF OF NAVAL OPERATIONS FOR AIR WARFARE, LT. GEN. WILLIAM J. WHITE, USMC, DEPUTY CHIEF OF STAFF FOR MARINE AVIATION; VICE ADM. ERNEST R. SEYMOUR, USN, COMMANDER, NAVAL AIR SYSTEMS COMMAND; VICE ADM. ROBERT R. MONROE, USN, DIRECTOR, RESEARCH, DEVELOPMENT AND TEST AND EVALUATION, OFFICE OF CHIEF OF NAVAL OPERATIONS; AND REAR ADM. JOSEPH B. WILKINSON, USN, DEPUTY COMMANDER, NAVAL AIR SYSTEMS COMMAND (PLANS AND PROGRAMS); COMMODORE JOHN C. WEAVER, USN, F/A-18 PROJECT MANAGER

Mr. PAISLEY. Mr. Chairman, I have a statement that I would like to submit for the record.

Senator GOLDWATER. It will be accepted.

Mr. PAISLEY. You have introduced everyone, so I won't have to go through that. I might say that I have a close affinity to this area because of my past experience in the aircraft industry, my experience in the military and my desire, it seems, to continue to fly ali the time. I probably spend more time in this area than I really should, but I really enjoy it. I remember when I was a young man, and you were a young man at the same time——

Senator GOLDWATER. That was a long time ago.

Mr. PAISLEY. You remember the football team and play of Blanchard to Davis, which was a famous football maneuver. Blanchard and Davis as a team did a great job and they had great linebacking. I might say in the Navy I have found a Blanchard-Davis team. It is McDonald to Seymour, and General White does all the backing in the line. I feel we have in this particular area probably the smoothest running team in defining requirements and carrying out the acquisition process.

I feel very good about that because, as I mentioned, it is a scenario I feel very close to. I have gone out, myself, and flown a handful of both Navy and Marine airplanes, as well as some of the helicopters, so I am trying to stay close to what I think are the firstline problems that we are having in this area.

I think the R. & D. program is well balanced to direct itself toward the near-term and long-term requirements of maritime superiority.

I have spent a lot of time going out to the labs. I have gone through all the naval labs, looking at their capability to stand behind the technical issues that are showing up and will show up in an R. & D. development program.

I think one of the strongest labs we have in the Navy is the Naval Weapons Center at China Lake. That laboratory does a lot of work in this area of discipline.

What I would like to do is have Admiral McDonald go through his statement and hold any questions, unless you desire otherwise, until after that.

Senator GOLDWATER. Fine. It is good to have you with us, Mr. Secretary.

Mr. PAISLEY. Thank you.

[The prepared statement of Mr. Paisley follows:]

PREPARED STATEMENT OF MELVYN R. PAISLEY, ASSISTANT SECRETARY OF THE NAVY (RESEARCH, ENGINEERING AND SYSTEMS)

INTRODUCTION

Mr. Chairman and Members of the Committee, it is an honor and a pleasure to appear before you for the first time to present the Department of the Navy fiscal year 1983 Research, Development, Test and Evaluation Tactical Air Program and Budget. I believe this Tactical Air program provides the balance to meet: the system improvements required for current Fleet aircraft; the requirements of the next generation aircraft; and the long-term Air needs through a strong technology base.

At the table with me today are Vice Admiral Robert R. Monroe, Director, Research, Development, Test and Evaluation for the Chief of Naval Operations, Vice Admiral W. L. McDonald, Deputy Chief of Naval Operations for Air Warfare, Lieutenant General W. J. White, Deputy Chief of Staff for Aviation, USMC, Mr. Gerald A. Cann my Principal Deputy, and Brigadier General Jacob W. Moore, Deputy Chief of Staff for Research, Development and Studies, U.S. Marine Corps, all of whom are known to the Committee.

In my presentation today, I intend to fulfill the commitment I made to the Congress in my confirmation hearing to be forthright in my dealings with the committees. I will begin my testimony with a brief discussion of our Research and Development Policy and Strategy, and how they are utilized in the Tactical Air and Weapon programs. I will then provide a brief overview of the Research and Development program.

With your permission, Mr. Chairman, I will provide for the record a statement which also describes in some detail programs of interest to the Congress.

RESEARCH AND DEVELOPMENT POLICY AND STRATEGY

Management philosophy.—My intent is to manage Research and Development programs using an open and participatory style. My organization and its interfaces are being restructured to provide for controlled decentralization and a team effort when Research and Development technical and business decisions are made.

The decisions made concerning the Research and Development programs to support the Secretary of the Navy's strategy have required a significant change in our Research and Development policy. We are intent on stabilizing and properly structuring the programs to meet the critical modernization required. Over the past six months, about 40 programs were cancelled to counter the tendency to spread dollars over too many programs. We have also focused on the performance and readiness thresholds required so programs deliver the baseline system without requirement creep and the costly attempt to meet gold-plated goals. We have stopped chasing rainbows; and each of the four major programs that I have reviewed since being confirmed was not approved for the next milestone until this policy was achieved. In addition, we are structuring joint programs whenever the requirements and timing are common. This has been very successful for the Advanced Self-Protection Jammer, the Extremely High Frequency Satellite Communication System, and the Joint Tactical Information Distribution System which were recently reviewed and approved for Full-Scale Development. To meet the needs of the Marine Corps, we have structured joint programs for the Light Armored Vehicle and the Mobile Protected Gun System, and we are structuring a joint program for Marine Medium Assault Transport (HXM).

Last year, Secretary Lehman reorganized the Secretariat to focus on the objectives he has defined for the Department of the Navy. I am closely working with the other Assistant Secretaries of the Navy to integrate our management functions and responsibilities into a close knit team for Research and Development System Management decisions. This team is also making decisions to delegate responsibility and authority in order to improve organization efficiencies and reduce layering. Within my own staff, I have restructured to focus on air, submarine/antisubmarine warfare, surface, and strategic issues. The emphasis on aircraft and missile issues is particularly pertinent because our Research and Development programs for the future aircraft and air missile systems require program and acquisition strategy to develop the system in the shortest time for the lowest costs.

As you can tell, my goal is to expedite the Research and Development process with a minimum of procedures and formal reviews. I have established communication in the vertical and horizontal directions of the organization, and I am working

to solve issues off-line to avoid the delays caused by formal documentation and meetings

All of the above management actions are analogous to the President's theme of "getting the government off the back of the people," as I plan to develop a system acquisition management process and organization structure that will get the system off the backs of the program managers, scientists, and engineers of our in-house and industrial teams.

System acquisition views.—I have made several references to actions to shorten the acquisition cycle. Every official in the Department of Defense makes shortening the cycle a primary objective. The problem has been that it is a very complicated issue and a thorough understanding of the trouble spots has not been achieved. I would like to briefly discuss with you several of the areas in the process that I consider to be trouble spots, and indicate steps we are taking to resolve them.

1. *Fuzzy requirements.*—Our requirements have been allowed to grow during development, especially between milestones, and this has increased the schedule and risk. Also, by using threshold and goals, we have increased costs and schedule to achieve the goal requirements when the threshold values would have been sufficient. This has stopped. The programs which have been recently reviewed will not change the requirements in the milestone phase approved. In addition, program requirements are only being defined as thresholds.

2. *Transition to production.*—The full-scale development and production phases were allowed to be decoupled causing gaps and poor technical transfer to production. This aspect of a program is being reviewed beginning at the first program milestone and at each milestone thereafter. We are now approving the use of concurrency when common sense and/or the risk of the development warrants it. This will not only shorten the cycle, but will permit a more effective transfer of the design to production.

Sparrow (AIM/RIM-7M) is an example of a program in which the Navy and Air Force accepted a plan with built-in concurrency based on our assessment of the risk and the anticipated payoff in cost savings due to a shorter development cycle and earlier procurement buys. Even though we have experienced some recent slip in completion of final testing due to manufacturing reliability problems, which we now feel we have corrected, Navy and Air Force will have a very capable weapon nearly two years earlier than if the program followed a purely serial development pattern. The above are examples of how trouble spots are being worked, and I am also utilizing new processes or adapting current processes to improve the acquisition strategy for systems. I will briefly describe two initiatives that I feel will have high payoff:

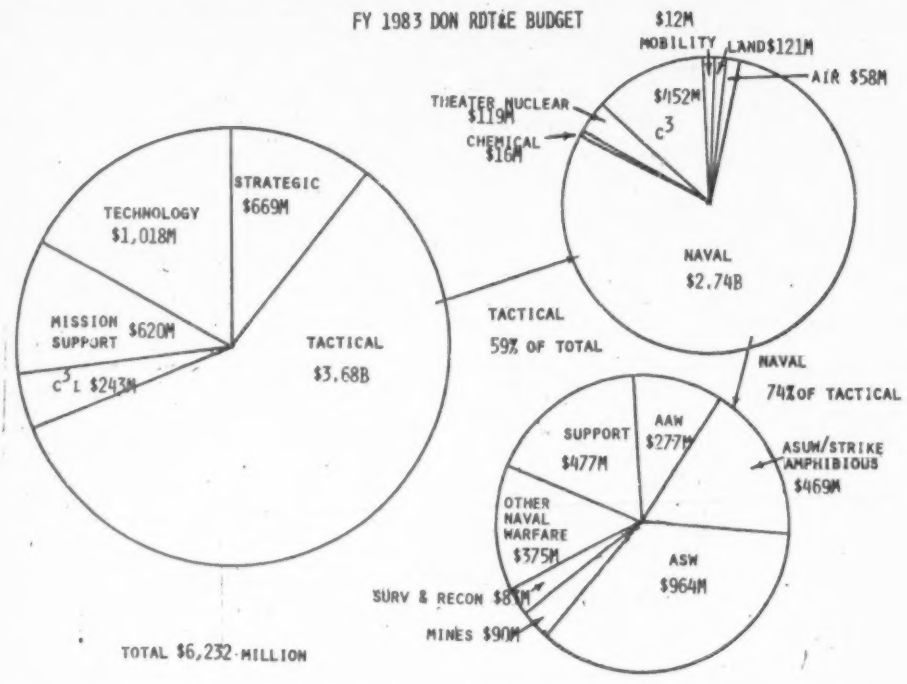
1. *Competition/incentives.*—Of the current Selected Acquisition Report programs, 70 percent were completed. Competition was utilized at a point in the development that made the program's development cost effective. This will continue. However, the contractor frequently does not have an incentive/award-type contract which can motivate the contractor to create a design that balances cost, performance, and readiness for the purpose of achieving a quality system at low-unit cost. Both Secretary Sawyer and I have taken steps to establish this as a way of doing business. During the past year, such competition initiatives have been used for the Advanced Self-Protection Jammer and the High-Speed, Anti-Radiation Missile programs. Also, the Tomahawk Cruise Missile has, or will have, competition managed by the Program Office for virtually every major subsystem.

2. *Pre-planned product improvement.*—Our weapon systems have been utilizing an effective form of pre-planned product improvement for many years by evolving, through engineering changes, to meet new threat changes and to use advanced technology. As used now, pre-planned product improvement will force more planning in the beginning of the program which will enable us to shorten the cycle and lower the costs of the development by utilizing a planned evolutionary process. Over 45 systems are currently candidates for pre-planned product improvement system acquisition strategy. But virtually every system is conceptually a candidate, and I have taken steps to ensure that pre-planned product improvement concepts have been used on each of the four programs for which I have conducted a milestone review.

One of the new starts we plan in fiscal year 1983 is a product improvement to the anti-ship Tomahawk and Harpoon family of cruise missiles where, for example, common radar guidance improvements for the two-missile family will, when completed, yield great improvements in missile efficiency, i.e., probability of kill in multiple ship formations, and greater penetrability through enemy ship defenses.

RESEARCH AND DEVELOPMENT PROGRAM ISSUES

The following chart breaks down our fiscal year 1983 RDT&E, Navy Budget into the various Budget Activities. The Air Warfare activity includes the Undergraduate Jet Flight Training System (VTXTS) and tactical aircraft weapon programs. Other important Air Research and Development is within the Naval Budget Activity in the appropriate warfare areas.



I would now like to highlight certain decisions, plans, and programs for you. I might add that my decisions are based on inputs from the Fleet. I have visited a carrier, a frigate, and an attack submarine and plan to participate in Fleet operations in the months ahead to continue to obtain a first-hand assessment of the Research and Development requirements. Also, control of the air remains an immutable imperative of successful Naval Operations. This guarantees that the Soviets are exposed to being placed at an extreme disadvantage. Hence, sea-based tactical air power continues to be essential.

Air.—There are two aircraft programs which will fill future needs—Vertical/Short Takeoff and Landing and the Undergraduate Jet Flight Training System (VTXTS). The Vertical/Short Takeoff and Landing development program is concentrating on technologies that could produce an aircraft that would, in the future, replace existing tactical, conventional aircraft. Recognizing the projected jet pilot trainer aircraft shortfall, the Navy is structuring an affordable Undergraduate Jet Flight Training System program that will meet the requirement in a timely fashion. This year, we will complete development and operational testing of the F/A-18, and the Marine Corps will receive the first squadron. We plan to continue evolutionary improvement to current aircraft such as A-6, F-14, S3, and P3 relative to engine, electronics, and sensor technology.

Anti-submarine warfare.—Measurable qualitative improvements in the Soviet submarine threat as well as the continuing Soviet submarine building program, makes it essential that we pursue a vigorous Research and Development effort to retain our current advantage. A key aircraft system in our defense in depth approach to Anti-Submarine Warfare is the Light Airborne Multi-Purpose System (LAMPS) III Weapon System. It is completing a very successful Test and Evaluation phase this year, and the management efforts of 1981 have been focused upon the tasks of transitioning to production. This system is planned for installation on the FFG-7, CG-47, and DD-963 classes. Important Anti-Submarine Warfare system improvements

to the P3 and S3 aircrafts are also in progress. Our sonobuoy programs are keyed to provide a hedge against projected threat improvements; and the Advanced Lightweight Torpedo (ALWT) program will provide the required weapon improvement. These aircrafts and their improved Anti-Submarine Warfare systems will assure that Air Anti-Submarine Warfare remains viable against future submarines.

Anti-air warfare.—Anti-Air Warfare requires our continued high priority action. Soviet cruise missile improvements necessitate Research and Development emphasis in over-the-horizon surveillance; outer air battle; area defense systems; and point defense systems.

Objectives of the Navy's Modernization program include near-term improvements in surveillance, targeting and Command, Control, and Communications, and long-term improvement for standoff weaponry. One result of this Research and Development is to increase Fleet battle space giving our weapon systems opportunity to engage the enemy in circumstances favorable to us—thus, enhancing warfighting effectiveness.

Over the past two decades, our Anti-Air Warfare weapons have been upgraded in an evolutionary way as the threat has changed. However, the time has arrived to improve both our long-range air-to-air missile and our area defense missile capabilities to counter the emerging Soviet aircraft and cruise missile threats. In the case of the air-to-air missile, a complete review of options for improving the PHOENIX (AIM-54C) will be undertaken including the examination of new system proposals.

Strike/anti-surface warfare.—As the F/A-18 fighter aircraft builds up for its December 1982 Initial Operational Capability, the key technical and operational evaluations required for the attack version production decision will soon commence. We are very pleased with the performance and reliability demonstrated in the hands of Navy personnel. U.S. Navy/U.S. Marine Corps deployment of this new multi-mission asset will add a new dimension in strike capability and flexibility worldwide. We are attempting to gain Australia's participation in vital fatigue tests scheduled this year for our mutual interest.

One of our biggest emphasis in strike warfare is to provide greater survivability for Fleet attack aircraft. This is accomplished through improved avionics such as Advanced Self-Protection Jammer, and ordnance standoff improvements are planned for ROCKEYE and the Anti-Personnel, Anti-Material bomb for loft delivery. We also plan to continue the joint Air Force/Navy Air-Launched TOMAHAWK Medium-Range, Air-to-Surface Missile program which will provide longer range capability and increase aircraft survivability.

Amphibious assault.—The Marine Corps' highest priority development program, The Marine Medium Assault Transport, a replacement for their aging CA-46 and CH-53A and D model aircraft, is being restructured within a new joint development program. This need and requirement for similar capabilities in other mission areas of the Navy, Army, and Air Force will be satisfied with a common advanced technology airframe, such as the XV-15 tilt rotor.

The overall Research, Development, Test and Evaluation program, which has been submitted for fiscal year 1983, is sound and balanced between low-risk developments to speed up the process and those to advance the technological frontier. The Department of the Navy is fully committed to implementing the Weinberger-Carlucci Initiatives which promise to shorten the acquisition cycle and minimize future acquisition costs. In particular, this program takes positive steps to implement my priorities for Research and Development. It continues the strides begun in fiscal year 1982 to recover our margin of safety, and the systems being developed are required to provide the modernization to support and complement the 15 Battle Groups as they provide for us the necessary "command of the seas."

Mr. Chairman, I wish to thank the Committee for the guidance and support provided in the past and look forward to participating in a continued fruitful relationship in the future. At this time, I stand ready to answer your questions. Thank you.

DETAILED REVIEW OF SELECTED PROGRAMS

The programs discussed in the remainder of this statement cover the Research Development Test and Evaluation for aircraft and weapon systems for aircraft which have been of recent interest to the Congress. I will begin with the aircraft programs.

AIR PROGRAMS

In this area, I will address several programs which will improve our capability in the near term; the F/A-18 and the Marine Medium Assault Transport (HXM), and

further in the future with Vertical/Short Takeoff and Landing and the Undergraduate Jet Flight Training System (VTXTS).

F/A-18

The F/A-18 will be employed in both Navy and Marine Corps fighter and attack squadrons. Tactical reconnaissance and a two-seat trainer version are also planned. The primary mission for the fighter applications is fighter escort with fleet air defense as a complementary mission. The attack missions are interdiction and close air support; 1,366 aircraft are scheduled for production. The employment of the first few aircraft in the Replacement Air Wing at Lemoore, California provides glowing feedback regarding capability and reliability. Interdiction range is much improved and projected to officially meet Navy requirements.

The funds requested in fiscal year 1983 will complete the development work yet to be accomplished, phase in the intermediate level support and realize the December 1982 Initial Operational Capability. Deficiencies resulting from the fiscal year 1981 Operational Test and Evaluation for the fighter mission and those identified in a formal technical evaluation this spring will be corrected along with subsequent attack Operational Evaluation deficiencies. As the full-scale engineering development effort is completed, the contract will be closed. Defense Systems Acquisition Review Council (DSARC) III (attack) is planned to be held in the Fall of 1982.

UNDERGRADUATE JET FLIGHT TRAINING SYSTEM (VTXTS)

Increasing operating and support costs and impending obsolescence of present flight training aircraft and support systems require development of a cost-effective replacement. The complementary aspects of flight training (flight, simulation, and academics) must be integrated to develop an effective and affordable system.

Parallel competitive contracts were awarded to industry for exploration of alternatives. The McDonnell-Douglas (British Aerospace) HAWK-based concept was the clear cut winner and was awarded a sustaining engineering contract last November while the Navy completes review of program options that will meet our needs and provide a quality, low-risk training system for future use. Initial Training Capability is anticipated for 1987 with Full Training Capability scheduled for 1988.

Future Congressional support of the program is said to be contingent upon the Navy adequately addressing the issues of program schedule, affordability, and priority. Navy is underway in developing a program plan, including an adequate funding profile for the selected system.

The Congress has further expressed dissatisfaction with the Navy's selection of only one contractor for the Pre-Full-Scale Development phase of the Undergraduate Jet Flight Training System program. The primary concern is that this action would result in greater cost vulnerability. As a hedge against unwarranted program cost, the Navy is continuing to investigate the T-2 start up as a viable option. The threat of potential termination, if costs are excessive, will provide the same effect as competition.

VERTICAL/SHORT TAKEOFF AND LANDING (V/STOL) AIRCRAFT DEVELOPMENT

The fiscal year 1982 Authorization and Appropriation action, essentially restructured the Navy Vertical/Short Takeoff and Landing Aircraft Development program as follows: $15M V/STOL Aircraft Development as envisioned by Navy was zeroed; $10M was appropriated for "Tilt Fan V/STOL Technology"; $5M was appropriated for AV-8B+.

The Navy has now established three related programs in the Vertical/Short Takeoff and Landing field:

a. Lift fan development.—Continuing the fiscal year 1982 direction of Congress this element provides for advanced development of fixed wing, Vertical/Short Takeoff and Landing technology for projected Navy and Marine Corps missions. The Propulsive Lift Systems project initiates development of a propulsive lift research device to be developed in cooperation with NASA Lewis Research Center. This device termed a multiple propulsion system demonstrator, will be used to determine the viability of several new propulsive concepts such as the tandem fan. In addition, it would be used to develop component hardware such as guide vanes, inlets, augmentors, and nozzles. Investigations will be conducted on critical propulsion issues such as reingestion, short-term engine ratings, engine thermal distortion tolerance, high-bleed compressors, and high-power transmission components.

b. AV-8B plus.—The Navy foresees requirements for operational aircraft capable of vertical and short takeoff and landing to meet multiple Navy mission require-

ments. There are several potential variants of the AV-8B aircraft which have not been appropriately examined. With 1982 funds, the Navy will examine potential variants of a lightweight radar system for the AV-8B.

c. Vertical/short takeoff and landing aircraft development.—This element provides for advanced development of fixed wing, Vertical/Short Takeoff and Landing technology for projected Navy and Marine Corps requirements. The A-6 Short Takeoff and Landing Demonstrator project provides for an advanced Short Takeoff and Landing high-lift technology demonstrator aircraft by integrating the two-dimensional Augmented Deflector Exhaust Nozzle (ADEN) with blown flaps on an A-6 aircraft which will have been modified with F-404 afterburning engines. The two-dimensional nozzle-vectored thrust technology provides a promising configuaration feature for further fighter and attack aircraft. The demonstrator will have the capability of a maximum carrier landing gross weight of 45,000 lbs in lieu of the present 33,500 lbs, for the same main landing gear axle load. The capability will permit landing at significantly higher fuel weights and will permit unexpended high value weapons to be returned to base.

MARINE MEDIUM ASSAULT TRANSPORT (HSM)

An airborne assault lift capability is fundamental to the Marine Corps ability to fulfill its mission. The present inventory of CH-46 and CH-53A/D aircraft are aging and do not provide sufficient lift for the modern force. The CH-53E acquisition program does not address this need. The CH-53E is a heavy lift aircraft designed primarily to lift heavy equipment in support of the assault. It is not a suitable vehicle for troop assault lift.

To address this critical need and possibly a number of Navy missions, we are joining with the Army, Air Force, and NASA in a joint advanced vertical lift program. Considerable progress has been made in coming together on a common multi-mission aircraft that takes advantage of advanced, mature Vertical/Short Takeoff and Landing technology. A joint technical assessment team and a joint requirements team with representatives from NASA and the Services have been meeting to establish the initial framework of this program. Our initial goal is to have a Request for Proposal issued prior to the end of the year. The Department of the Navy strongly supports this joint undertaking as the best means of achieving the most effective combat capability at an affordable price. The Marine Corps lift capability is deficint now and age driven attrition of the current inventory will become critical in the late 1980's. This, coupled with the moderate schedule risk of the joint advanced program, means we must be prepared to procure a gap-filler aircraft to preclude a sharp drop in Marine Corps lift capability. The gap-filler program which would be an "off-the-shelf" type of acquisition, must be tied closely to the advanced program which is still in its formation stages. Next year, we will have a much clearer picture of the projected Initial Operational Capability for the developmental effort and what interim program we should pursue.

WEAPON SYSTEMS

In this area, I will address several programs which will improve our capability in the near term as both programs are finishing development.

IMAGING INFRARED (IIR) MAVERICK

IIR MAVERICK is a short-range, direct-fire weapon currently undergoing full-scale engineering development. The Navy version (AGM-65F) is a moderation of the Air Force AGM-65D version which is in operational test and evaluation during fiscal year 1982. A fuze redesign is underway to correct deficiencies discovered during environmental testing, and the fully qualified fuze will be ready for operational, test, and evaluation in fiscal year 1983.

Over the past three years, the Congress has transferred Navy budgeted funds to the U.S. Air Force for administration as Lead Service. The Navy has requested funds for this program in fiscal year 1983 to conduct Navy-unique development and operational test and evaluation, for which the U.S. Air Force is not equipped.

AIR-LAUNCHED TOMAHAWK (MEDIUM RANGE AIR-TO-SURFACE MISSILE)

This program will develop a medium-range, air-to-surface missile to destroy high-value ship and shore targets while minimizing attrition of launch aircraft. The missile has a dual-mode seeker, imaging infrared for ship targets, Terrain Contour Matching/Digital Scene Matching Area Correlation (TERCOM/DSMAC) for land targets. It will employ a conventional Harpoon warhead. The program as directed

by Congress is a joint Navy/Air Force program developing an air-launched Tomahawk variant suitable for aircraft carrier operations.

In fiscal year 1983, the Navy will continue with full-scale engineering development of the dual-mission, air-launched Tomahawk. We continue to examine the basic issues of survivability and cost.

SPARROW (AIM/RIM-7M)

The final phase of the Sparrow (AIM/RIM-7M) Joint Operational Test and evaluation will begin in April using the first production lot missiles from Raytheon. Our first attempt at Operational Test and Evaluation in the summer of 1981, using pilot-lot missiles which were also used for the very successful Joint Test and Evaluation, was terminated. Both the Navy's Operational Test and Evaluation Force and the Air Force Test and Evaluation Command recommended that Operational Test and Evaluation be halted due to repeated failures. A large percentage of the missiles that failed had been repeatedly handled, used for extended periods of captive carry, and had been modified with up to two software changes. We will resume the joint Operational Test and evaluation with all new missiles built entirely on production tooling. Until the testing verfies the reliability of the AIM/RIM-7M missile, we are holding production rate build up to a maximum of 100 per month in order to reduce the risk of potential retrofit or rebuild. We believe we have the reliability problems resolved and that in August or September a decision can be made to proceed to higher build-up rate.

The second-source contractor, General Dynamics/Pomona, should be ready to competitively bid on the fiscal year 1983 procurement buy. This will, from our experience on AIM-7F, produce lower cost and more reliable missiles.

SPARROW is an example of a program with built-in concurrency that has, assuming we encounter no more problems, resulted in an earlier completion of development (nearly two years shorter than the very successful SIDEWINDER AIM-9M) and an earlier entry into production, thereby saving inflation dollars.

HIGH-SPEED, ANTI-RADIATION MISSILE (HARM)

The joint Navy/Air Force Operational Testing on High-Speed, Anti-Radiation Missile was halted in January 1982, when, during the third missile firing (an Air Force firing), the missile experienced a wing flutter instability which saturated the autopilot leading to a flight failure. Several other technical issues were also identified which included a missile dip flight path at launch which is operationally unsatisfactory, a rear tail assembly latch problem, and other minor issues. Software and hardware fixes have been identified for all the problems, and a parallel hardware design fix for the flutter problem has been initiated.

The joint Operational Testing has resumed with planned completion in late August 1982. A major joint service review in late September 1982 will determine the production rate build up in fiscal year 1983. During the completion of Operational Test and Evaluation, the low-rate production is being limited to a maximum of 10 missiles per month in order to reduce risk until final test data verify the High-Speed, Anti-Radiation Missile performance and reliability.

Second-source competition for High-Speed, Anti-Radiation Missile as an all up round has begun and is funded within the Navy and Air Force to qualify a second source and have that contractor ready for a competitive procurement split in fiscal year 1985.

SKIPPER II/LOW-LEVEL, LASER-GUIDED BOMB

The Navy and Air Force are curretly finalizing the two-shot Skipper II (a MK-83 Laser-Guided Bomb booster with a SHRIKE rocket motor and modified with a geebias kit) and two MK-82 Low-Level, Laser-Guided Bomb, also called Pave Way III, demonstration program to be held soon at Eglin Air Force Base. Based on the previous success of the Skipper II flight tests at the Naval Weapons Center, the Navy is considering a plan to produce a thousand Skipper II kits for modification of the current MK-83 Pave Way II laser-guided bombs in our inventory. We also desire to qualify our attack aircraft to carry the Air Force MK-82 and MK-84 Low-Level, Laser-Guided Bomb. It will be necessary for us to request reprograming authority soon if we adopt these plans.

Senator GOLDWATER. Admiral McDonald?

STATEMENT OF VICE ADM. WESLEY L. McDONALD, USN, DEPUTY CHIEF OF NAVAL OPERATIONS FOR AIR WARFARE

Admiral McDONALD. Mr. Chairman, it is a great pleasure again for me to appear before the distinguished members of this subcommittee to present the requirements of naval aviation as they relate to the fiscal year 1983 budget request.

This morning I will present an assessment of our current naval aviation capabilities, the threats that are driving our future requirements and modernizations, and the objectives for naval aviation established by the Secretary of Defense and the Secretary of the Navy.

I would like to focus my discussion on our carrier battle group capabilities by mission area, strike warfare or power projection, antiair warfare, antisubmarine warfare and, of course and very important, support.

To proceed with this mission area discussion, I would like to begin with strike warfare, or our power projection capabilities.

Today, strike aircraft will have to fly against increasingly sophisticated Soviet surface-to-air guns and missiles, both ashore and aboard Soviet surface combatants. New systems, such as the SA-NX-6 surface-to-air missile system found on the *Kirov,* have longer range, improved low-altitude capability, multimode guidance systems and overlapping layers of defense.

Concurrently, Soviet land targets are becoming increasingly [deleted] and ships are being designed with much greater survivability features.

We currently employ two different attack-type aircraft within our carrier air wings—the medium attack A-6E Intruder and the light attack A-7E Corsair. We have made a significant improvement to the attack capability of the A-6 with the introduction of the Target Recognition Attack Multisensor or TRAM, system. I think you have seen that operating, Senator.

The A-6 can designate a target with a laser beam for precise aiming and delivery of laser-guided bombs. The TRAM's forward-looking infrared system, or FLIR, permits the A-6 to play an important role in maintaining the all-important surface surveillance picture.

Senator GOLDWATER. Have you had any more trouble with the A-6 since the accidents last year?

Admiral McDONALD. I would like to find some wood to knock on, Senator. No, sir. We have pretty well held the A-6 accident rate down to a relatively low level. The EA-6B rate was significant last year. That has now tailed off also. We feel with the A-6 community, with directed attention that we put on that, and particularly in the EA-6B community which was the recipient of not very high awards last year because of the accident rate, by managing it differently as far as quality of pilots going into that system, we have significantly reversed the trend so far this year.

Senator GOLDWATER. Did you ever determine the basic cause of those accidents? Were any related to aerodynamics at all?

Admiral McDONALD. No. I think you will find in the A-6 accidents there were a multitude of different causes. Some of them were pilot induced. There were several material failures that oc-

curred. There was no thread that gave a common cause factor in the A-6 or the EA-6B accidents that we have had.

We have held extensive investigations in both of those fields, Senator.

I think you will notice that the A-6 looked pretty good last year while the EA-6B was relatively high rate.

Senator GOLDWATER. The rate was 5.5 for the A-6 and 21.6 for the EA-6B?

Admiral MCDONALD. Yes, sir.

Senator GOLDWATER. That all happened quickly?

Admiral MCDONALD. Yes. There was a rash of accidents. The number of flight hours on the EA-6B is considerably less than the number of flight hours you fly on the A-6 because of the number of aircraft that are available. The rate is based on 100,000 hours of flight time, as is the Air Force reporting system, also.

Accidents occurring with fewer number of flight hours obviously drives that rate up significantly. I am not comfortable with it. Last year, naval aviation enjoyed its best accident-free year, or best safety record, achieving a rate of 4.95. This was the first time we have ever been under anything close to 5.0.

We have a goal this coming year of 4.70.

The A-7E Corsair will begin phasing out of the active-duty inventory and into the Naval Reserve squadrons in the mid-1980's.

Senator GOLDWATER. How many of those do you have left?

Admiral MCDONALD. We have 24 squadrons of A-7E's in the active duty; we have 6 squadrons in the Reserve. I will have to provide the exact number because my book does not show the A-7. We are not procuring A-7 in this timeframe.

Senator GOLDWATER. Let me know how many are active and how many are flying in the Reserve.

Admiral MCDONALD. Yes, sir. We will give you the numbers that are in the pipeline, those in the active fleet, those in the Reserve, and those in that pipeline.

Senator GOLDWATER. You still have those in the pipeline?

Admiral MCDONALD. I am sure there are some airplanes in the pipeline, just to sustain the 24 squadrons.

[The information follows:]

TACTICAL WARFARE

A-7E INVENTORY

	1983	1984	1985	1986	1987	1988
Active operating						
Reserve operating			[Deleted]			
Pipeline						
Total aircraft						

The Reserves are presently operating six squadrons of A-7B aircraft as shown in the following table. Their transition to the A-7E's is programed to commence in fiscal year [deleted] and be completed in fiscal year [deleted] as the A-7B's complete their service life. Six Reserve squadrons will be maintained throughout the transition period.

A-7B INVENTORY

	1983	1984	1985	1986	1987	1988
Reserve operating						
Pipeline			[Deleted]			
Total aircraft						

Admiral SEYMOUR. The pipeline will be existing for both Active and Reserve, Senator. We have what they call the primary authorized PAA; that is, the number of aircraft in the squadrons. Then there is a pipeline that essentially provides for some aircraft being out in the depot for standard depot-level maintenance and so forth. It is not a production pipeline; it is a pipeline to support the active fleet.

Admiral MCDONALD. I was talking of the pipeline to replace those aircraft that are in the squadrons. Although this aircraft is being replaced by the Hornet, it has been modernized by the addition of a FLIR pod to permit the A-7 to locate, identify, and attack targets at night and remains a very effective tactical weapons system.

The AV-8B Harrier fulfills the U.S. Marine Corps requirement for an advanced V/STOL attack aircraft for future force projection capability. This unique aircraft will provide responsive close air support for the ground commander by combining the speed and fire-power of a modern jet attack aircraft with unrestrained basing flexibility.

The introduction of the F/A-18 into the fleet in fiscal year 1983 to replace the A-7—and the F-4—will provide an aircraft with a quantum improvement over all of our current aircraft in terms of reliability and maintainability, thereby helping to reduce our manpower requirements. The Hornet, which has both fighter and attack capabilities, will add a tremendous measure of flexibility to our carrier air wings.

The Hornet has demonstrated an operational readiness rate superior to any tactical aircraft in our inventory. Not only is it consistently ready to fly but also once airborne it is an awesome performer, as several Members of Congress have recently had the opportunity to observe firsthand, and as you had when you flew a year ago.

But even as capable as our aircraft are, we still suffer deficiencies in strike warfare in the standoff, air-to-surface weapons and our ability to target them. We are working to reverse these deficiencies with the development of the Maverick, Harpoon, and Harm missiles.

The laser Maverick is an air-to-surface, short-range, direct-fire variant of the Air Force's TV guided missile with a semiactive laser seeker. The missile is currently planned for Marine Corps use only but will be employed with a single-rail launcher adaptable to both Navy and Marine Corps tactical aircraft.

Laser Maverick will be used in close air support/battlefield-interdiction missions to attack enemy installations, equipments, and supplies within the amphibious objective area and in deep support for the destruction of targets outside that area.

In antisurface warfare, Laser Maverick will be used to attack hostile aircraft on the ground, missile sites, radar installations and air support areas. This weapon with its [deleted] and penetrating blast-fragmentation warhead, offers a highly versatile capability against a wide spectrum of targets. The initial deployment of the missile will be on the A-4M aircraft.

The Imaging Infrared, or 12R Maverick will enter the inventory in the mid-1980's and will provide our FLIR-equipped attack aircraft, such as the A-6, A-7 and F/A-18, the ability to make attacks against targets at night, [deleted].

Senator GOLDWATER. What has been your experience with Maverick?

Admiral MCDONALD. We have not had any operational experience, sir. We are still in the development phase with it. As we have indicated, we plan to use the Laser Maverick to support the Marine Corps. As far as the R. & D. is concerned, I think Admiral Monroe can discuss some of the problems we have seen in the development phases.

Mr. PAISLEY. Bob, you might as well get something on the record on this.

Admiral MONROE. We changed our Navy warhead from the Air Force 125-pound shaped charge, [deleted] to a 300-pound penetrating blast-fragmentation warhead, which gives us a much better capability against a wide variety of targets [deleted]. Many of the problems concerning the Air Force I^2R Maverick seeker holding lock, as discussed in the recent Washington Post articles, aren't as dominant for the Navy version, because ships are our primary targets, and a ship's hot IR signature against cool water gives a greater capability to hold lock. When used against land targets, the Navy I^2R Maverick would be employed in deep interdiction where you don't have a serious penalty—as you might in close air support—if the weapon does not hold lock.

Admiral MCDONALD. I will shift now to Harpoon, which is an all-weather antiship missile capable of launch from aircraft, submarines or surface ships, and as such it is the most widely deployed major weapon system in the U.S. Navy.

The introduction of the air-launched Harpoon to our A-6 aircraft has greatly extended the range from which the A-6 can attack ship targets. The Harpoon can be successfully launched from an A-6 [deleted].

Harpoon is now deployed on the A-6E and P-3B/C aircraft with future integration planned for S-3A, A-7E and F/A-18 aircraft.

Senator GOLDWATER. Do you launch the Harpoon off all aircraft?

Admiral MCDONALD. We have not to this date, sir. We have launched them from P-3's and A-6's. We have plans to put them on S-3's and A-7's and it will be integrated with the F/A-18.

We had a very successful Harpoon shootdown off Roosevelt Roads, in the Puerto Rican operation area where an A-6 coordinated an attack; [deleted] all missiles guided to the target and performed as expected. The Harpoon launch range was about [Deleted] miles.

Senator GOLDWATER. Can you use it on the F-14?

Admiral McDONALD. No, sir. It is not planned on the F-14. The F-14, of course, carries the Phoenix missile as a fleet air defense missile. We are not planning to carry Harpoon on F-14.

Follow-on guidance improvements to the Harpoon include [deleted].

Standoff weapon delivery is only one element of strike warfare. Another element critical to the survivability of our strike aircraft is defense suppression. For this we must have the ability to shut down or destroy radars providing information/control to SAM and AAA systems. Part of this capability rests with the EA-5B and the self-protection electronics countermeasures, ECM, equipment in our tactical aircraft, mainly the new ALQ-126B and the Airborne Self-Protection Jammer, or ASPJ.

For hard kill, we will introduce the High Speed Anti-Radiation Missile, or HARM, in the mid-1980's.

I would like to stress how urgently we feel that HARM is needed in the fleet. It will have greater speed, longer range and far greater frequency coverage than the Shrike and Standard ARM it replaces. The outcome of all tactical operations which we hypothesize against today's threats is strongly influenced by whether or not we have HARM, and whether we have it in sufficient quantities.

Senator GOLDWATER. How large is that weapon?

Admiral McDONALD. The weapon is a 10-inch diameter weapon that weighs about 807 pounds. It can be launched, depending on the delivery mode and the altitude, [deleted]. We use in a sort of [deleted] to go that distance.

Senator GOLDWATER. What is your guidance system? Is it laser guided?

Admiral McDONALD. It is an antiradiation missile, Senator, it homes on the radiations that are put up either by the radars or the missile-control system, sir.

Senator GOLDWATER. Not infrared?

Admiral McDONALD. No, sir, it does not use an infrared seeker.

Senator GOLDWATER. What is the warhead?

Admiral McDONALD. The warhead is [deleted] it will work through the [deleted] Senator, that we perceive that the Soviets are using in their [deleted]. It is much more effective than the Shrike and the Standard ARM.

Senator GOLDWATER. Who is making that?

Admiral McDONALD. Texas Instruments is building HARM, sir.

Senator GOLDWATER. You have them in the inventory now?

Admiral McDONALD. No, sir. The first ones are in production right now. We are in the test phase. The first delivery is planned in fiscal year [deleted] Senator.

As to the quantity in the test phase, we brought 54 prior to 1980 and 45 in 1980. Initial production was 80 in 1981, 118 are programed in 1982, with delivery beginning in [deleted]. We are requesting 208 in this budget.

Senator GOLDWATER. This is the aircraft that has a flutter problem?

Admiral McDONALD. That is correct, sir.

Senator GOLDWATER. Is the flutter in the tail?

Admiral McDONALD. The flutter is in the wings, sir. We have had several other discrepancies with it.

Mr. PAISLEY. Let me say a little bit about that, Senator.

The flutter in the wing problem was at the zero load condition. When the wing was unloaded it developed a flutter problem. We put in a software fix to keep it off this mode. We have had a flight since the fix was put in and it appears that the flutter problem has been solved through the software fix.

Senator GOLDWATER. What speed does this missile reach?

Admiral MCDONALD. [Deleted] I am told.

Senator GOLDWATER. This will be carried by the F-18?

Admiral MCDONALD. Yes, sir.

Senator GOLDWATER. How many will it carry, two?

Admiral MCDONALD. It depends on the load you want to put on it. I believe it can carry [deleted].

Senator GOLDWATER. What is the cost?

Mr. PAISLEY. I think the procurement unit cost in the 31 December SAR for the entire buy is $288,000 in then year dollars. I think I had better give it to you accurately, but let us talk about it loosely, Senator, because of your particular interest. We will give you for the record the exact cost on it.

As I recall, over the entire buy—I was talking about the negotiated contract the other day—I believe it is $288,000 average unit cost over the entire buy. I think on the first buy our design-to-goal for first 5,000 miles was $116,000 in fiscal year 1978 dollars plus 40 for the program cost. We will give that to you accurately, but that is the order of the cost on it.

[The information follows:]

HARM

As reported in the December 31, 1982 Selection Acquisition Reports, the procurement unit costs for the combined Navy and Air Force quantity of [deleted] missiles is $129,500 expressed in base year (fiscal year 1978) dollars, or $288,100 in then-year dollars.

Admiral MCDONALD. While we have been developing these missiles, Senator, we have also been attempting to fill a long-standing requirement for a medium-range air-to-surface missile, or MRASM as it is called, that permits strike aircraft to attack ship and land targets from well outside the target's defensive umbrella. In July 1981, Congress directed the Navy to develop the AGM 109L to fill a standing operational requirement for a MRASM. The AGM 109L is a lightweight version of the Tomahawk missile. The Navy MRASM is currently funded at the level necessary to provide development of all components common to both Navy and Air Force MRASM.

The combination of these weapons—Harm, Maverick, Harpoon and MRASM—will significantly improve our standoff attack capabilities.

The second major warfare area is antiair warfare, where the principal threat lies in Soviet cruise missiles which can be launched from submarines, surface combatants and long-range bombers. Some of these cruise missiles can be launched from up to [deleted].

Since these missiles are usually small and fast, they are extremely difficult to locate, much less to shoot down. Thus we stress killing the launch platform, be it a submarine, surface ship or a Backfire bomber at its base, prior to any weapon launch.

The E-2C Hawkeye provides air surveillance for the battle group and control of the fighter and attack aircraft. [Deleted.] The E-2C's [deleted] is also being improved to permit [deleted].

A major deficiency of the E-2C is the [deleted].

The EA-6B is a most important element in our antiair warfare capabilities. [Deleted.]

The primary deficiency of the EA-6B is the number that we have in our inventory. Currently we have enough to support only nine squadrons of four aircraft each. With the continued planned procurement of EA-6Bs we will achieve a 12-squadron force structure by fiscal year 1987, still two squadrons short of the requirements for 14 carriers in that time period.

Our objective is continued EA-6B procurement to achieve 14 Navy squadrons and at the same time provide for the needs of the Marine Corps. An improvement to the EA-6B in the early 1980's, designated ICAP II, will expand the frequency coverage jammable by the aircraft and provide improved capability against more sophisticated Soviet ECCM techniques.

Our main offensive antiair warfare capability rests in the F-14 Tomcat. The F-14, coupled with its long-range AWG-9 radar and its Phoenix missiles, is our first line of defense. The F-14/AWG-9/Phoenix missile combination has demonstrated an outstanding kill probability of approximately [deleted] percent. Nevertheless, there are three areas of concern with the F-14—the weapon system, the engine, and our force levels.

An important improvement to the weapon system in the next few years is the replacement of the analog processor of the AWG-9 with a new digital, programmable signal processor, or PSP. The PSP will improve the radar's reliability and maintainability, reduce its susceptibility to jamming, and improve the capability to identify targets at longer ranges.

The TF-30-414 engine has been a source of serious concern both in terms of [deleted] as well as [deleted].

We currently have an ongoing component improvement program that [deleted].

The Navy plans to transition all [deleted]. We have just transitioned the 15th and 16th Navy fighter squadrons from F-4's to F-14's [deleted].

Senator GOLDWATER. When did the F-14 come into the inventory?

Admiral MCDONALD. In the early 1970's, Senator. I think the first squadron stood up in approximately 1972. I can have one of my people check that further.

Senator GOLDWATER. What is your maintenance rate on those aircraft?

Admiral MCDONALD. Infrequent maintenance man-hours per flight-hours?

Senator GOLDWATER. Yes.

Admiral MCDONALD. I don't have the accurate figure. To be fairly close; it is the forties. I will provide the accurate figure, the latest fleet information we have, for you and for the record.

My backup tells me it is in the classified statement. I don't have a copy of that with me, but we will provide that, sir.

[The information follows:]

F-14 MAINTENANCE MAN-HOURS PER FLIGHT-HOURS

The most recent twelve month period for which we have data is February 1981 through January 1982. The total maintenance man-hours per flight hour was 49.4. This includes scheduled and unscheduled maintenance at both the squadron and intermediate levels.

Admiral McDONALD. As mentioned earlier, all of our light-attack squadrons will be equipped with the F/A-18. Since these aircraft are fully fighter capable, they will be able to augment the F-14 in the outer air battle if the threat levels dictate. The relative ease of pilot adaptation to the F/A-18 systems operations is reinforcing our total confidence that our attack squadrons will be able to swing to the fighter role at any given time. This will provide the battle-group commander an unprecedented level of flexibility that can prove absolutely vital in determining the outcome of a battle.

Our air-to-air missile inventory reflects the short-range Sidewinder or AIM-9, the medium-range Sparrow, or AIM-7, and the long-range Phoenix, or AIM-54, missiles which will make up our inventory through the 1980's.

The AIM-9M is the latest version in the series of the Sidewinder infrared, guided, short-range, air-to-air missile and will be used on Navy and Marine Corps fighters and some light attack aircraft.

The AIM-9M has a significantly improved capability in its ability to acquire a target against a heat-reflective background. In the areas of performance and reliability the AIM-9M retains the same capability as the highly successful AIM-9L, as demonstrated in the recent Libyan incident. The electronics have been repackaged to use modern manufacturing methods and to facilitate repair.

The current Sparrow, AIM/RIM-7M, is both an air- and surface-launched weapon. It is a semiactive, medium-range missile which will be employed by Navy F-4, F-14 and F/A-18 fighter aircraft and surface ships having the NATO Sea Sparrow system. The 7M variant of the Sparrow missile incorporates a new target seeker featuring improved missile guidance performance in electronic countermeasure and clutter environment areas which represented extreme performance limitations in the AIM-7F. The AIM-7M is expected to be fully capable in the face of known [deleted] and it will provide improved capability in other ECM environments.

A Sparrow follow-on, AMRAAM, is under development by the Air Force and will be introduced in the late 1980's. AMRAAM will significantly increase the F/A-18's AAW, antiair warfare, capability.

The AIM-54C Phoenix missile stands alone as the finest long-range air-to-air missile in the world and can only be carried by the F-14. We have achieved an impressive success rate in Phoenix firings from Navy Tomcats.

The Phoenix missile is undergoing an improvement program to increase its capabilities. Major changes are being made to the AIM-54A to produce the AIM-54C; they are state-of-the-art computer circuitry, improved targeting and fuzing capabilities, and better electronic countermeasures.

Looking ahead, preliminary planning is already underway to develop a Phoenix-like missile capable of much higher speeds and ranges for the threat of the 1990's.

Unfortunately, we have an inventory shortage of air-to-air missiles, especially the most capable new series of each missile, but we are working to remedy that situation. Our ships need a full loadout of our best missiles, since the most critical phase of any war will be fought with what we have available in theater.

Our antiair warfare forces are relatively modern and very capable. Our modernization efforts and research and development programs are structured to provide an expanded battle space by striving for longer-range surveillance and target identification with improved radars and passive sensors, and for greater all-source information/data correlation to improve the employment of our resource-limited force.

We are striving for faster, longer-range missiles to enable earlier intercept, missiles with better ECCM capabilities, multishot capabilities in small missiles and improved fuzing [deleted].

I have highlighted primarily what I would call a war-at-sea scenario wherein the principal air threat is land-based bombers equipped with antiship missiles, but Navy fighters must also escort strike aircraft on power-projection missions and must be highly maneuverable in order to engage enemy air-superiority aircraft.

Antisubmarine warfare, ASW, is the third major warfare area for our carrier air wings. Airborne SW will be discussed in hearings before the Seapower Subcommittee, so I will not dwell on it here. I will say, however, that our R. & D. thrusts in ASW are toward more rapid detection, classification and kill of the new Soviet submarines. We must be successful. If we are not successful in destroying submarines such as the *Oscar*, then what was a difficult ASW problem becomes the very difficult ASW problem of destroying a large number of high-speed antiship missiles in flight.

The final air elements of our carrier battlegroups are support aircraft that each contributes to the effectiveness of all the aforementioned warfare areas.

These aircraft are our COD aircraft—C-1 and C-2; our tanker aircraft, the KA-6; our reconnaissance system with the Tactical Air Reconnaissance Pod System, or TARPS, and our special electronic reconnaissance aircraft, the EA-3.

First, our COD aircraft—the lifeline of our deployed carriers. Our small, gasoline-engine-powered C-1's are on their last legs. Our C-2's are limited in number. To relieve this problem we are procuring 39 new C-2's in a multiyear procurement plan to replace our older, dwindling assets.

The procurement of additional CH-53E helicopters as VOD aircraft will also add depth to our logistics effort in certain areas of the world.

Our airborne KA-6D tankers are vital to all warfare areas but especially to AAW strike. They can extend the time that an F-14 can stay airborne for combat air patrol, extend the strike range of an F/A-18, A-7 or A-6, or save an aircraft that is running low on fuel. The most affordable option for maintaining our tanker force is to convert older A-6's to KA-6D's.

Reconnaissance is vital to the proper planning of any military operation and we derive our information from a variety of sources; however, there continues to be a need for battlegroup assets to provide timely intelligence.

We have recently introduced TARPS as a system to replace the RF-8 aircraft aboard our carriers. The pods are carried by the F-14 from within the 24 F-14's assigned to the carrier fighter squadrons. We will continue to rely on the F-14 with TARPS until the introduction of a follow-on system in the late 1980's.

The final aircraft is the EA-3B, a special electronic reconnaissance aircraft, selectively operated aboard deployed carriers. The limited number of EA-3B's will continue to operate into the mid-1980's. Replacement options are currently under study.

I have discussed our major warfare areas, our deficiencies, and the new systems that I see solving these deficiencies.

I would like to add that the introduction of V/STOL aircraft remains attractive if by doing so we can reduce carrier vulnerability while at the same time increasing operational flexibility and maintaining mission effectiveness.

As did Admiral Hayward, I urge your full support for the fiscal year 1983 V/STOL program which will permit the Navy to proceed logically with the development of a medium-speed, lift-fan technology demonstrator V/STOL aircraft, with first flight in 1986.

Senator GOLDWATER. Are you going to go into this more later?

Admiral MCDONALD. Yes, sir.

In concluding, I believe that the individual aircraft that form our naval air forces are extremely capable and will hold their own against any threat in carrying out their mission.

Our need for improved standoff capabilities, both air to air and air to surface, is evident in the face of the current and evolving threat.

Our plans are to extend the effective sphere of influence of the carrier to permit it to adequately carry out its missions of sea control and power projection ashore.

We have the basic ingredients. I strongly echo the Chief of Naval Operation's words in his posture statement when he stated, "The future of naval aviation is bright and we should continue to dominate the air for the remainder of the decade and beyond." But to do so, we must sustain our efforts to provide the necessary cohesive links permitting carrier battlegroups and naval aviation as a whole to retain their unchallengeable position on the seas of the world.

Naval aviation, like the Navy as a whole, is on the move. We are significantly more capable today than 2 years ago.

[The prepared statement of Admiral McDonald follows:]

PREPARED STATEMENT OF VICE ADM. WESLEY L. MCDONALD, U.S. NAVY, DEPUTY CHIEF OF NAVAL OPERATIONS (AIR WARFARE)

Mr. Chairman, it is again a great pleasure for me to appear before the distinguished members of this subcommittee to present the requirements of Naval Aviation as they relate to the fiscal year 1983 budget request.

This morning, I will present an assessment of our current Naval Aviation capabilities, the threats that are driving our future requirements and modernizations and the objectives for Naval Aviation established by the Secretary of Defense and the Secretary of the Navy. Before addressing major points of this assessment, I would like to make three observations.

First, I am extremely pleased by the successful role that the Carrier Battle Group has performed as an instrument of foreign policy over the past few years and especially this past year. Responding to crisis situations throughout the world, the Carrier Battle Group arrives first and stays longer with more ready fire-power than any other military force. Recent operational periods have caused higher operating

tempos than those experienced during the Vietnam era, have stretched our aviation resources to the limit, and have caused continual hardships on our personnel. But these same operating periods have also exercised our forces in a way that makes Naval Aviation today more capable to carry out our warfare assignments. The operational readiness of these Aviation units gives credence and viability to our planning promise that our monetary investment to ensure the Carrier Battle Group's ability to be ready, and powerful enough to preserve peace, is essential in providing for maritime security.

Second, our national wartime strategy requires that we maintain the ability to protect U.S. interests on any level of conflict. Among those levels of conflict is the peacetime deterrence posture resulting from convincing potential adversaries that predictable loss from military action will far exceed any expected gains. Based on the dramatic increase in Soviet seapower we have recently witnessed, and that which we can foresee in the next 20 years, a constant and growing threat will exist for the U.S. Navy and its ability to carry out its missions. While the overall number of ships in the Soviet fleet will decline, their total capability and quality will increase, and their ability to conduct all types of naval warfare throughout the world's oceans will improve. The plans and programs which are supported by the present budget request provide Naval Aviation with the capability, and the commitment, to maintain a flexible regional responsiveness such that the Navy's tactical air at sea superiority, and this forces' ability to project power ashore, remains second to none. The development of these Naval Aviation requirements is measured carefully against a Soviet Navy that is also capable of conducting naval warfare operations on any level of conflict.

And third, in achieving and maintaining this Naval Aviation force, we have carefully allocated resources into four major elements in order of priority—[deleted]. While each element has its constituency, a prudent resource planner must avoid arbitrary prioritization in favor of a balanced approach, where each element is permitted to interact in attaining the highest possible force effectiveness. We have attempted to do exactly that in this budget request.

Against this backdrop, I would like to briefly assess our force effectiveness, highlight our strengths and deficiencies, and discuss our plans to correct these deficiencies.

There are three central elements that determine our force effectiveness: the state of readiness of our naval forces to carry out their assigned missions, the quality and quantity of people who maintain and operate the systems, and the capabilities of the individual weapon systems to perform in an efficient and effective manner.

The state of material readiness of our Naval Forces is an absolutely key element in our ability to carry out assigned missions. An appropriate level of aircraft material readiness must be maintained to ensure the required force of responsive and available mission capable aircraft. The CNO has established a mission capability goal, or MC rate, of 70 percent for our operating aircraft. This MC rate is a key indicator of material readiness of our units, and the goal of 70 percent means that on the average, seven of ten aircraft assigned to a unit must be available for mission tasking at all times. We have increased funding of readiness related items in our budget and exercised extraordinary management initiatives to reach our stated objective. Even with this directed attention, our gains in the past year have been modest, but given the complexity of the problem and the length of the supply pipeline, we are seeing encouraging results. Naval Aviation is not where we want to be in terms of our readiness goals but we are working hard to get it there, dedicating significant resources to do this and are beginning to see the indicators pointing in the right direction.

Readiness is affected by numerous logistic elements and attention has been focused on the areas which will improve the level of aircraft material readiness. One of the major logistic elements that clearly reflects the increased allocation of resources to achieve improved readiness and MC rates is that reflected in aircraft spares. The budget provides for initial spares for outfittings and inventory support of new and modified aircraft. It also provides spares to replenish the attrition of inventory that support the flying hour program and operations of aircraft already in the fleet. The funding request for aircraft spares in fiscal year 1983 is $2,080 million; $932 million for initial spares, and $1,148 million for replenishment spares. The fiscal year 1983 funding level is increased from approximately $500 million in 1978 to the current level of $2.0 billion and reflects a special program approved by CNO to address the correction of spares attrition deficiencies from prior years. Specifically, $280 million in fiscal year 1983 is designated to correct spares deficiencies which adversely impact readiness of carriers and Marine air groups. Although delivery of replacement spares requires approximately two years from time of procure-

ment, we have already been able to realign existing assets to anticipate future receipts. The fiscal year 1983 funding request provides for all current year spares requirements.

In addition to increased spares procurement, strong emphasis has been given to the Naval Aviation Depot Level Maintenance Program since readiness is directly affected by this vital logistic element. The fiscal year 1983 budget reflects funding to support all validated requirements for aircraft and engine rework as well as component repair. The contribution of these efforts to aviation material readiness is reflected by the upward trend in aircraft mission capability. The diminishing number of bare firewalls, or the holes in aircraft for lack of an engine, is another key readiness indicator. We expect to reduce the engine bare firewall count from the projected level of 66 in fiscal year 1982 to the CNO goal of 36 in fiscal year 1983. The tempo of operations is also a major influence on readiness; fiscal year 1983 resources are allocated to maintain a level of flight hour operations that will keep aviators proficient and ensure a high level of readiness to accomplish their primary missions.

The quality and quantity of people is the second central element that determines our force effectiveness. At this time last year, I stated that I had a deep concern for the critical shortage of trained petty officers and aviators in our forces. I am relieved to be able to report that the initiatives of the Administration, the Congress, and the support of this committee have reversed what appeared to me to be a very dangerous trend. To the extent that we can sustain these initiatives with their implied positive impact on improving the retention of highly qualified personnel to man and maintain our aircraft, we can count on a substantive increase in full weapon system capabilities. Beginning with the Nunn-Warner amendment to the fiscal year 1981 National Emergencies Act and continuing through to passage of the Uniformed Services Pay Act of 1981, military compensation underwent the most significant improvement since the mid-1960s. The Aviation Officer continuation Pay (AOCP) program, in particular, has been effective in stanching the hemorrhage of highly talented pilots and naval flight officers. The AOCP program accounted for retention of 489 pilots and 110 naval flight officers that our analyses told us would have left the service in fiscal year 1981. At a training cost for pilots and naval flight officers of $759 thousand and $509 thousand respectively, the gross savings were about $427 million. That kind of return on the $26 million investment that the AOCP program cost in 1981 to me reflects a sound business decision by anyone's standard. These pay improvements have provided the means to stem the flow of critical skills to civilian pursuits and to stabilize the aviation pilot situation before it assumed catastrophic proportions. It is important, however, to realize that we are not out of the woods yet with regard to retention of high-quality people. It must be understood that, although 1981 was a good year in retention, we started from a serious deficit position that cannot be overcome with one year's improvement. It is essential that we sustain our momentum and complete compensation reforms including extension of AOCP beyond the September 30, 1982 expiration date so that we can permanently eliminate inadequate pay as a primary disincentive to a military career. I applaud the Congress' efforts with regard to these issues and I elicit your support in continuing to approve programs vital to our retention effort.

The last element in the effectiveness equation is the capability of our weapon systems, which includes force level considerations. Our current carrier force level consists of 12 deployable carriers, a carrier in SLEP at Philadelphia and a training carrier, the Lexington. For each deployable carrier we have an air wing assigned. With the introduction of the USS *Vinson* in 1983, we will have 13 deployable carriers and we are planning to standup a 13th air wing. When the USS *Roosevelt* enters service in 1988, we will have 14 deployable carriers and a 14th air wing requirement. The Navy's 600 ship objective, built around 15 CV battle groups, will require a 15th air wing in the 1990s.

When discussing a carrier battle group, an issue that usually surfaces is its offensive versus defensive nature. The purpose of a carrier battle group is twofold: to provide for control of the sea lanes and to project significant air power ashore. Although many look at the sea control role as defensive, it is just the opposite. The concept of sea control requires the carrier battle group to control a very large area around the battle group center. A sea control area can roughly be considered a circle with a radius of from 300 to 500 miles or about 280,000 to 790,000 square miles of ocean or the littoral areas. The focus of a battle group's controlled area could be an amphibious group, an all important SLOC, a vital port facility, an amphibious landing area, or even a friendly nation that is being threatened by external forces. Controlling access to this area is critical to the survivability of the forces employed.

I would like to focus my discussion on our carrier battle group capabilities by mission area, i.e., strike warfare or power projection, anti-air warfare, antisubmarine warfare, and support. To proceed with a mission area discussion, I would like to begin with strike warfare, or our power projection capabilities. Today, strike aircraft may have to fly against increasingly sophisticated Soviet surface-to-air guns and missiles, both ashore and aboard Soviet surface combatants. New systems, such as the SA-NX-6 surface-to-air missile system on the KIROV, have longer range, improved low altitude capability, multimode guidance systems, and overlapping layers of defense. Their ships are being designed with much greater survivability features and their land targets are becoming increasingly hardened.

We currently employ two attack aircraft within our carrier air wings—the medium attack A-6E Intruder and the light attack A-7E Corsair. We have made a significant improvement to the attack capability of the A-6 with the introduction of the Target Recognition Attack Multisensor or TRAM system. With TRAM, the A-6 can designate a target with a laser beam for precise aiming of laser-guided bombs. The TRAM's forward looking infrared system, or FLIR, permits the A-6 to visually acquire, identify, and attack a target at night. The FLIR also permits the A-6 to play an important role in maintaining the all-important surface surveillance picture. A-6E procurement rate is planned to permit the achievement of a 14-carrier air wing force structure by 1987, to provide for the conversion of older A-6s to KA-6Ds to maintain our tanker force, and to provide required numbers of aircraft to assure A-6 force levels into the mid 1990s.

The A-7E Corsair will begin phasing out of the active duty inventory and into the naval reserve squadrons in the mid-1980s. Even though the *Hornet*, which will replace this aircraft, is much more capable and versatile in this light attack mission, the Corsair is still a very effective aircraft which has been modernized by the addition of a FLIR pod to permit the A-7 to locate, identify, and attack targets at night.

The introduction of the F/A-18 *Hornet* into the fleet in fiscal year 1983 to replace the A-7s and the F-4s will bring an aircraft with a quantum improvement over current aircraft in terms of reliability and maintainability, allowing us to reduce our manpower requirements. The *Hornet*, which has fighter and attack capabilities, will add a tremendous measure of flexibility to our carrier air wings.

The technical problems discovered early in the *Hornet* development program have received a great deal of attention throughout this program's history. Through precise and persistent analysis and dogmatic efforts to correct these deficiencies early on, I am happy to report to you that we have identified the causes and effected the cures. I would like to emphasize that this painstaking development effort has not only taught us a great deal about the F/A-18, but about the methods and techniques we must use to develop and test future aircraft. There is, for example, great benefit in devoting sufficient resources and attention very early in an aircraft program, so that design deficiencies can be identified and corrected long before they become operational problems. In addition, early investment in reliability, in design, development, and test, provides a long-term savings many times the initial cost.

The past two training deployments by VFA-125—our first F/A-18 fleet replacement squadron—have borne out the points I have just addressed. The *Hornet* has demonstrated an operational readiness rate superior to any tactical aircraft in our inventory. Not only is it consistently ready to fly, but once airborne it is an awesome performer, as several members of the Congress have recently had the opportunity to observe.

Returning to the assessment of our strike capability, the primary strike warfare [deleted]. We are making significant advances in the weapons area with the Maverick, Harpoon, and Harm missiles. The Imaging Infrared, or I^2R Maverick, will enter the inventory in the mid-1980s and will provide our FLIR-equipped attack aircraft, such as the A-6, A-7, and F/A-18, the ability to make low-altitude attacks against targets at night with up to [deleted].

The introduction of the air-launched Harpoon to our A-6 aircraft has extended greatly the range from which the A-6 can attack ship targets. The Harpoon can be successfully launched from an A-6 [deleted].

A recent fleet exercise is indicative of the significant advances we have made recently. On 14 November 1981, three A-6E TRAM Intruders from Attack Squadron 75 launched from the USS *John F. Kennedy* for a combined Harpoon and Standard Anti-Radiation Missile (ARM) firing exercise. The target was a 400 foot destroyer hulk. The firing, a simultaneous lanuch of two Standard ARMs and one Harpoon, was the first U.S. Navy stand-off, antiship attack by fleet TACAIR. The two Standard ARMs impacted the ship just as the Harpoon entered its terminal attack profile. One ARM entered on top of the bridge house and exploded inside the ship's structure; the other exploded on the deck just aft of the bridge area. The Harpoon im-

pacted amidships. Three quick direct hits. This was an impressive test and the fleet is rightfully excited—it's the first major improvement in weapons that they have seen in many years. But we cannot become complacent. The Navy has been attempting to fulfill a long-standing requirement for a medium range air-to-surface missile (MRASM) that will permit strike aircraft to attack ship and land targets from well outside defensive umbrellas. In July 1981, Congress directed the Navy to develop the AGM 109L to fill a standing operational requirement for a MRASM. The AGM 109L, or the Navy MRASM, is a light weight version of the Tomahawk missile system now deployed as ground-launched, surface-launched and sub-surface launched cruise missiles. Navy MRASM is currently funded at the level necessary to provide development of all components common to both Navy and Air Force MRASM.

Standoff weapons delivery is only one element of strike warfare. Another element critical to the survivability of our strike aircraft is defense suppression. For this we must have the ability to shut down or destroy enemy radars, which provide key information to SAM, and AAA systems. Part of this capability rests with the EA-6B and the self-contained ECM equipment in our tactical aircraft, mainly the new ALQ-126B and the Advanced Self Protection Jammer or ASPJ. For hard kill, we plan to introduce the High Speed Anti-Radiation Missile or HARM, in the mid-1980s. HARM is urgently needed. It will have greater speed, longer range and far greater frequency coverage than the SHRIKE and Standard ARM it replaces. [Deleted.] The outcome of almost all tactical operations which we hypothesize against today's threats is strongly influenced by whether or not we have Harm, and whether we have it in sufficient quantities.

The combination of Harm, Maverick, Harpoon, and MRASM will significantly improve our standoff attack capabilities.

The second warfare area is anti-air warfare for which the principal threat lies in Soviet cruise missiles which can be launched from submarines, surface combatants, and long-range bombers Some of these cruise missiles can be launched from up to [deleted] miles away; some fly as high as [deleted] feet with speeds as high as [deleted] times the speed of sound; [deleted]. Since these missiles are usually small and fast, they are extremely difficult to locate, much less shoot down. Thus we stress killing the launch platform—be it a submarine, surface ship, or a BACKFIRE at its bomber base—prior to a weapons launch. To make the air-to-air problem manageable, we must extend our surveillance platform area so we can detect the enemy early but we must also deny the Soviets targeting data on our forces. Denying the enemy targeting data dictates they approach closer to our force where greater firepower is concentrated. The AAW problem truly requires defense-in-depth, but since TACAIR plays little to no role in close to the Battle Group units, I will address only the outer air battle in this assessment.

The E-2 Hawkeye provides air surveillance for the battle group and control of the fighter and attack aircraft in any ensuing engagements. A new antenna and radar processor, developed during the early 1980s, will provide [deleted]. The E-2C's [deleted] is also being improved to permit more accurate target identification. The continued procurement of E-2C's will permit modernization of all of our carrier air wings with the E-2C. A major [deleted]. Currently, we are pursuing a short-term solution—the HAVE QUICK modem to the ARC-182 radio. The long-term answer is the introduction of the Joint Service Tactical Information Distribution System, or JTIDS, in the late 1980s.

Also contributing to the AAW surveillance picture are the EA-6B and S-3, employing their passive sensors to provide target warning, bearing and identification. As mentioned earlier, the EA-6B is a most important element in our anti-air warfare capabilities. The EA-6B can jam or degrade many of the guidance and communications links associated with the Soviet cruise missiles or their launch platforms. The primary deficiency of the EA-6B is the numbers that we have in our inventory. Currently, we have enough to support only nine squadrons of four aircraft each. This has put an enormous burden on these nine squadrons while trying to support 12 carriers. With the continued planned procurement of EA-6Bs, we will achieve a 12-squadron force structure by fiscal year 1987, still two short for the 14 carriers we anticipate in that time period. Our objective is to continue EA-6B procurement to achieve 14 Navy squadrons and at the same time to provide for the similar needs of the Marine Corps. An improvement to the EA-6B in the early 1980s, the ICAP II (Improved Capabilities II) model, will expand the frequency coverage jammable by the aircraft and will provide improved capability against more sophisticated Soviet ECCM techniques.

Our main offensive anti-air warfare capability rests in the F-14 Tomcat. The F-14, coupled with its long-range AWG-9 radar and its Phoenix missiles, is our first

line of defense. The F-14/AWG-9/Phoenix missile combination has demonstrated an outstanding kill probability of approximately [deleted] percent. Nevertheless, there are three areas of concern with the F-14—the weapons system, the engine, and force levels. An important improvement to the weapon system in the next few years is the replacement of the analog processor in the AWG-9 system with a new digital, programmable signal processor, or PSP. The PSP will improve the radar's reliability and maintainability, reduce its susceptibility to jamming, provide the capability to identify targets at longer ranges, and improve long-range target resolution. The TF-30-414 engine has been a source of serious concern both in terms of [deleted] as well as [deleted]. We currently have an on-going component improvement program that should [deleted]. The changes being proposed by the manufacturer are designed to eliminate the early deficiencies of this engine and to restore it to an acceptable standard of reliability and performance. We are monitoring this very closely. The Navy plans to transition all *Forrestal* and subsequent carrier air wings to the F-14 by the late 1980s. We have just transitioned the 15th and 16th Navy fighter squadrons from F-4s to F-14s and will transition the 17th and 18th squadrons this year.

As mentioned earlier, all of our light attack squadrons will be equipped with the F/A-18. Since these aircraft are fully fighter capable, they will be able to augment the F-14 in the outer air battle if the threat levels dictate. The relative ease of pilot adaptation to the F/A-18 systems operations is reinforcing our total confidence that our attack squadrons will be able to swing to the fighter role at any given time. This will provide the battle group commander an unprecedented level of flexibility that can prove absolutely vital in determining the outcome of a battle.

Our air-to-air missile inventory reflects a mixture of short-range Sidewinder (AIM-9), medium range Sparrow (AIM-7), and long-range Phoenix (AIM-54) missiles, which will make up our inventory through the 1980s. A Sparrow follow-on, AMRAAM (Advanced Medium Range Air-to-Air Missile), is under development by the USAF and will be introduced in the late 1980s. AMRAAM will significantly increase the F/A-18's AAW capability. We have major product improvement programs underway for the other missiles—the AIM-9M, AIM-7M and AIM-54C. These programs are focused toward improved reliability and better protection against enemy ECM systems. Predictably, we currently have an inventory shortage of air-to-air missiles, especially the most capable new series of each missile, but we are working to remedy that situation. Our ships need a full loadout of our best missiles, since the most critical phase of any war will be fought with what we have available in theatre.

Our anti-air warfare forces are relatively modern and very capable. Our modernization efforts and research and development programs are structured to provide an expanded battle space by striving for longer range surveillance and target identification with improved radars and passive sensors, and for greater all-source information/data correlation to improve the employment of our resource-limited force. We are striving for faster, longer-range missiles to enable earlier intercept; missiles with better ECCM capabilities; multishot capabilities in smaller missiles; and improved fuzing against small targets such as antiship missiles. I have highlighted primarily what I would call a war-at-sea scenario wherein the principal air threat is land-based bombers equipped with antiship missiles. But Navy fighters must also escort strike aircraft on power projection missions and must be highly maneuverable in order to engage enemy air superiority aircraft.

Antisubmarine warfare—ASW—is the third major warfare area that our carrier air wings must be able to prosecute. The threat is a rapidly growing fleet of Soviet submarines that get quieter, go faster, dive deeper, and carry more antiship cruise missiles. We have seen the recent addition of the *Oscar*, [deleted]. Submarines, such as the *Oscar* if not countered by our ASW forces, can rapidly change to a formidable AAW threat. Nuclear submarines, when combined with very quiet, diesel-powered submarines, create an acutely critical problem for us at sea.

The integral battle group air assets for ASW are the fixed-wing S-3 Viking and the SH-3 Sea King helicopters onboard our carriers, and our SH-2 LAMPS helicopters onboard our surface combatants.

Of these integrated ASW assets, the S-3 Viking has had continuing reliability and maintainability problems. To improve this situation, we have placed significant management effort, and funding, into an S-3 readiness improvement program. Additional spares are being delivered now and we expect to see availability rate improvements this year. Progress, though accelerating, is slow. We have planned a Weapon System Improvement Program (WSIP) in the mid-1980s to update the S-3's radar to provide increased reliability and a long-range surface ship identification capability which will add greatly to our anti-ship warfare capabilities. Further improvements

in the acoustic processing suite will accompany an improved ESM system with greater coverage and classification capability. Since the S-3 production line is closed, we have a fixed number of assets to operate the current 11 squadrons. When CVN-71 enters the fleet in the late 1980s, we will stand up the 12th squadron. At that time, we will be faced with a shortage in S-3 aircraft. This shortage will grow through the 1990's, and become critical with the introduction of modern air wings on CVN-72 and subsequent carriers. Since we do not envision an S-3 replacement aircraft until the late 1990's, we will be faced with a decision to reopen the S-3 line previous to this date or develop a replacement aircraft.

The SH-3 Sea King provides the battle group with an inner-zone ASW capability. [Deleted.] The SH-3 is an old helicopter, and our projections show a severe shortage of assets developing as these aircraft begin to retire in the mid 1980's. To prevent this, we are planning to extend the service life of the SH-3 airframes until its planned replacement, an SH-60 variant [deleted] can be introduced. The SH-3s will then be transferred to our SAR force.

The P-3 Orion is a vital element in the outer zone of the ASW defense of the battle group as well as a mainstay of our distant surveillance forces. In 1983, the Navy's budget funds a new modification of the production P-3C, the Update III. This improvement features the Advanced Signal Processor (ASP), or Proteus, acoustic system which will give the P-3C a dramatic increase in its ability to detect the Soviet front line submarines. In addition, the Proteus system is software programmable to allow the P-3 to adapt rapidly to improved sensors now in advanced development. The P-3 is also equipped to carry and launch the aforementioned Harpoon missile for forward-area ASUW missions. This dual ASW/ASUW punch makes the P-3 a vital element in battle group operations when the battle group is within reach of the P-3's advanced bases.

The final battle group air ASW assets are the LAMPS helicopters—the older LAMPS MK-I SH-2 and the new (IOC 1984) MK-III SH-60B. The Navy plans to retain some older surface combatants in the active fleet longer than originally envisioned. These ships, while not capable of handling the SH-60, must continue to have SH-2s available to them if we are to maximize our ASW capability. Currently we are short of LAMPS asset because the SH-2s are having to cover MK-III ships such as DD-963s prior to the delivery of the SH-60. The SH-2 procurement planned for in the FYDP will provide additional assets to cover the LAMPS MK-I decks, especially those decks that will be utilized by the Reserves.

Our R&D thrusts in ASW are toward more rapid detection, classification, and kill of the new Soviet submarines. We must be successful. If we are not successful in destroying submarines such as the OSCAR, what has been a difficult ASW problem becomes a very difficult AAW problem of destroying large numbers of high-speed antiship missiles in flight.

The final air elements of our carrier battle groups are support aircraft that each contribute to the effectiveness of all of the aforementioned warfare areas. These aircraft are our COD aircraft, the C-1 and C-2; our tanker aircraft, the KA-6; our reconnaissance system with the Tactical Air Reconnaissance Pod (TARPs), and our special electronic reconnaissance aircraft, the EA-3.

First, our COD aircraft—the lifeline of our deployed carriers. Our small gasoline engine powered C-1's are on their last legs. Our C-2's are limited in numbers. To relieve this problem, we are procuring 39 new C-2's, in a multiyear procurement plan, to replace our older, dwindling assets. We have one overused, highly praised US-3A that has been the essence of essentiality to the logistic success of our carriers on their extended deployments in the Indian Ocean. We are converting five more aircraft to US-3A's. These will greatly help. The procurement of additional CH-53E helicopters as VOD aircraft will also add depth to our logistics effort in certain areas of the world.

Our airborne KA-6D tankers are vital to all warfare areas but especially to AAW and strike. They can extend the time that an F-14 can stay airborne for combat air patrol, extend the strike range of an F/A-18, A-7 or A-6, or save an aircraft that is running low on fuel. With the continued procurement of the A-6E, the most affordable option for maintaining our tanker force is to convert older A-6s to KA-6Ds. Contrary to popular perception initial evaluation of the F/A-18 in the carrier regime reveals that it does not appear to generate additional tanking requirements, but we are continuing to examine this very closely and will plan accordingly. We are also developing a new aerial refueling store to further enhance our tanking capability and flexibility.

Reconnaissance is vital to the proper planning of any military operation and we derive information from a variety of sources. However, there continues to be a need for battle group assets to provide timely intelligence. We have recently introduced

the Tactical Airborne Reconnaissance Pod, or TARPS, as a system to replace the RF-8 aircraft aboard our carriers. The pods are carried by the F-14 from within the 24 F-14s assigned to the carrier fighter squadrons. We will continue to rely on the F-14 with TARPS until the introduction of a follow-on system in the late 1980s. During the 1980s, the only dedicated aircraft to acomplish this all-weather reconnaissance capability will rest in the Marines' RF-4B.

The final aircraft is the EA-3B—a special electronic reconnaissance aircraft selectively operated aboard deployed carriers. The limited number of EA-3Bs will continue to operate into the mid-1980s. Replacement options are currently under study.

I've discussed our major warfare areas, our deficiencies, and the new systems that I see solving these deficiencies. I would like to add that the introduction of V/STOL aircraft remains attractive if by doing so we can reduce carrier vulnerability while at the same time increasing operational flexibility and maintaining mission effectiveness. In the CNO's statement, he mentioned that the Navy is criticized for not having sufficient vision to realize the potential of distributing its TACAIR assets on platforms other than carriers. Yet on the other hand, Congressional constraints have made it impossible to proceed with any alacrity in search of such potential. The major reduction in our fiscal year 1982 request for V/STOL technology illustrates the point. As did Admiral Hayward in his statement earlier this year, I urge your full support for the fiscal year 1983 V/STOL program which will permit the Navy to proceed logically with the development of a medium-speed lift fan technology demonstrator V/STOL aircraft. This technology would provide potential resolution of such missions as ASW, AEW, tanker and carrier-on-board delivery (COD). We are additionally planning to explore augmented deflected exhaust nozzle (ADEN) technology using an A-6 airframe.

I am also very pleased to be able to report to you that the Navy has now made a commitment to join with the Army and Air Force on a joint development project for an Advanced Vertical Lift Aircraft (JVX) which could meet the Marines' HXM requirement for a medium weight class assault transport aircraft of the 1990s. The Army will be lead service and the project's goal is to build a common vehicle which all services can use in various mission roles. Our immediate, primary uses are for the Marines' assault transport and for Navy Combat SAR, but we will also be actively exploring other naval mission applications for JVX, as well.

Our procurement strategy for naval aviation can be categorized as follows: first, to extend and to improve our current systems as much as possible through SLEP/CILOP; second, to strive for maximum commonality among new systems and subsystems for better procurement, support efficiencies, and operational flexibility; and third, to make maximum use of off-the-shelf systems. The details of this plan are contained in our Naval Aviation Plan which is the master document for naval aviation.

This brief overview of naval aviation has summarized the capabilities of our current 12 active carrier air wings and our maritime patrol forces. The Navy also has two reserve air wings that we are attempting to upgrade and to make them as similar and as capable as our active air wings, although this must be bounded by affordability considerations. I have not included in this discussion the tremendous contribution, and capabilities, that USMC aviation adds to the Navy's capabilities. I will defer to LGEN White to discuss his concerns and issues directly affecting Marine Corps aviation.

I would like to comment briefly on the issue of affordability. It is well documented that we have not been procuring aircraft in the last decade in sufficient quantities to maintain our force structure. There have also been a number of occasions when either I, or my predecessors, have had to recommend a system with less capability than some of the proposed options. With the increased funding allocated to the Navy, I am confident we will have a greatly improved force. But affordability will, as it should, remain a crucial issue with all of our programs. We obviously will have to continue to prioritize our allocation of funds; and I am sure we will continue to find ourselves recommending, due to affordability, the procurement of austere systems rather than higher cost options which some would like to see. We own you, the members of Congress, that kind of stewardship and that kind of accountability. My most essential task will continue to be the funding of systems that offer the highest capability payoff within allocated ceilings. We will have to continue balancing funds between the all important procurement of new systems and the equally important improvement of current systems. This last item, concerning the funding of system upgrades for current aircraft, is probably the root of our major funding problem today. We must continue to improve the readiness and maintainability of current systems while enhancing their capabilities prior to the introduction of follow-on sys-

tems. We fully recognize the importance you have placed of readiness and gratefully acknowledge the support you have provided in this critical area.

An area that, with concentrated extra effort, can save us many dollars and, more importantly, irreplaceable lives in aviation safety. We have focused significant attention on safety during the past few years and it appears to have paid off to the extent that I can report to you that 1981 was by far the best aviation safety year to date. The magnitude of improvement over the past several years is encouraging and represents significant savings in lives and destroyed aircraft. The averages for the past four years are:

	Calendar years—	
	1977–80	1981
Mishaps	[1] 6.38	[2] 4.95
Destroyed aircraft	103	87
Fatalities	104	83

[1] Mishaps (rate 124).
[2] Mishaps (rate 100).

Of particular note is the dollar savings in destroyed aircraft over 1980. There were 12 destroyed aircraft in 1980 and only 87 in 1981. Considering that replacement costs for combat aircraft average approximately $30 million each, the cost avoidance associated with this record of achievement represents approximately $750 million.

In concluding, I believe that the individual aircraft that form our naval air forces are extremely capable and will hold their own against the threats imposed by an enemy in carrying out their mission. Our need for improved standoff capabilities, both air-to-air and air-to-surface, is evident in the face of the current and evolving threat. We plan to extend the effective sphere of influence of the carrier to permit it to adequately carry out its missions of sea control and power projection ashore. A vital element in all of this is the requirement for communications links that are jam resistant, secure, and have a low probability of intercept. Timely information is the key to success, and we must be able to communicate reliably to control our forces if we are to succeed against a numerically superior threat. Readiness is the other vital key; our aircraft and weapons systems must be available—that means spare parts, repair capabilities and built-in reliability on the order of that we are seeing in the F/A–18.

We have the basic ingredients. I echo the CNO's words in his posture statement, "The future of Naval Aviation is bright and we should continue to dominate the air for the remainder of the decade and beyond" and share his optimism. However, to ensure this forecast becomes reality, we must sustain our efforts to provide the necessary cohesive links permitting carrier battle groups and naval aviation as a whole to retain their unchallengeable position on the seas of the world. Naval aviation, like the Navy as a whole is on the move. We are significantly more capable today than two years ago.

Admiral McDONALD. With your permission, sir, I would like to ask General White to discuss those unique programs that the Marine Corps is responsible for. He has a brief oral statement also.

Senator GOLDWATER. General, you may proceed.

STATEMENT OF LT. GEN. WILLIAM J. WHITE, USMC, DEPUTY CHIEF OF STAFF FOR MARINE AVIATION, OFFICE OF THE CHIEF OF NAVAL OPERATIONS, DEPARTMENT OF THE NAVY

General WHITE. Good morning, Mr. Chairman.

Let me begin by saying it is again a privilege for me to address you on the state of Marine aviation. I am pleased to report that especially within the last year we have made significant progress in increasing the combat capabilities of our aviation squadrons. For the first time we have been able to put new aircraft systems into

the hands of the Fleet Marine Force and by all reports these systems are working exceedingly well.

To illustrate that point, I will describe the status of three of those programs, the major ones. I will do so in order of their arrival in our Fleet Marine Force squadrons:

I will start first with the CH-53E, built by Sikorsky. Our first squadron at New River, N.C., is equipped with a full complement of 15 aircraft and will be fully ready for operational deployment starting in June.

Our second squadron on the west coast at Tustin, Calif., has just received its first two 53E's. We anticipate complete outfitting of that squadron by the end of this calendar year, in the month of December as a matter of fact.

The Fleet Marine Force pilots flying the 53E have given nothing but rave notices concerning its performance. They are routinely lifting 14.5 ton loads and have made a sufficient number of 16-ton lifts to demonstrate that very heavy lift is well within the ability of the aircraft.

As for the 1983 budget, we are requesting 11 CH-53E's to help us establish our third squadron in the fiscal year 1985 timeframe. These first three squadrons will enable the Marine Corps to meet its heavy lift requirements for the M-198 which weighs 8 tons and its prime mover, which weighs 12.5 tons.

The 53E is designed to carry those heavy loads; however, the planned introduction of the lightly armored vehicle, LAV, which weighs 14.5 tons, in large numbers into the Marine Corps inventory will increase our requirements for 53E's.

The next aircraft in order of arrival in the Fleet Marine Force——

Senator GOLDWATER. Before you proceed with the AV-8, you have had a rather high accident rate in that. How do you explain that?

General WHITE. Mr. Chairman, on the AV-8A, yes, indeed, we have had a high accident rate. It is higher than we desire.

We have, as a remedial action, been much more selective in our selection of pilots. We have increased the replacement pilot training syllabus. We have made greater use of our two-seater aircraft. As a matter of fact, our accident rate with the AV-8A is coming down slowly but steadily.

You must recognize we are dealing with an aircraft that represents 1950 technology. We are also dealing with a small community. We do not generate large numbers of flight-hours.

In contrast, the AV-8B has been designed to take care of some of the high pilot workload problems we have experienced with the AV-8A. It is going to have a sophisticated stabilization attitude hold system which is almost entirely lacking in the AV-8A. It is going to have a raised, enlarged cockpit to assist the pilot's workload. It is going to have improved lift.

I could go on, but I assure you that as far as the AV-8B is concerned it will be a much safer aircraft, much easier aircraft to fly, than the original AV-8A. You must keep in mind that in many respects the Marine Corps is writing the book on V/STOL military operations.

Through the results of our experience in the last 11 years and those of the RAF, we think we have improved the concept and now are ready to move on the AV-8B.

Senator GOLDWATER. I am very interested in this. We have been told that 1981 was the best year for naval aviation safety. With a goal of no more than six major accidents per 100,000 flying-hours, the Navy-wide average was an impressive 4.95. The lowest rates were achieved by the Fleet Training Command and the patrol squadrons. The highest accident rates in 1981, Navy-wide, were turned in by the Marines: Fleet Marine Air Force, Atlantic, 14.8; Marine Reserves, 6.5; Fleet Marine Force, Pacific, 6.2.

Have you an explanation for this consistenly high Marine accident rate?

General WHITE. Mr. Chairman, you have to consider that the Marine Corps is equipped almost solely with tactical aircraft. We do not have the training command, a large transport fleet, a large patrol fleet of P-3's that fly low-risk operations and generate large sums of flight-hours.

We are flying tactical aircraft. We train hard and most of our environment is in low-altitude attack work. It certainly carries a high risk. This is not to excuse or apologize for our high accident rate. As a matter of fact, last year the accident rate was the third lowest accident rate we have experienced in the last 10 years.

I might point out that the turnaround point occurred for Marine aviation last July. Since last July we have been steadily reducing our accident rate. So, as we stand this morning our accicent rate is 6.1 and I fully anticipate that we will complete this year with a rate that is much lower than last year.

It is very difficult, of course, to predict the future in aircraft safety, but I feel confident in predicting we will have a very good, safe year.

Senator GOLDWATER. In 1981 the Marine aviation accident rate for the AV-8 was 6.4. That is almost 12 times greater than the average Navywide. Now, this all can't be pilot error. Do you train your pilots in helicopters before they fly the AV-8?

General WHITE. No, we do not.

Senator GOLDWATER. Do you think it would be wise to do that?

General WHITE. We are considering right now the introduction of at last five flights in our UH-1 helicopter to give the V/STOL pilot the visual clues needed to hover the AV-8 aircraft.

Senator GOLDWATER. Do your accidents mostly occur in the vertical takeoff, vertical landing, or do they occur in flight?

I remember there were some problems for a while in the A, if I remember correctly, at high speed turns. Do you have any engine problem? Are you having mechanical problems associated with this aircraft to cause this rate?

General WHITE. The area of greatest vulnerability in flying the AV-8A is in the vertical work, vertical takeoffs and vertical landings, again attributed to the high VTOL workload imposed on the pilot in flying this aircraft.

Again, I say that we have been watching carefully and analyzing all of our AV-8 accidents so that when we designed the AV-8B we factored out these types of accidents. As a matter of fact, the reports we are receiving from our test pilots who have flown the full-

scale development AV-8B's indicate to us that we have successfully eliminated about 65 percent of this workload.

Senator GOLDWATER. I recall my one flight in it. I can't believe that in vertical ascent you can have trouble develop so rapidly that you can't control it. Does it get completely away from the pilot?

General WHITE. Mr. Chairman, it is a case of where we are operating this aircraft that enters into our accidents. We are using this aircraft in remote sites that are apart from the established airfields, going into restricted areas, very much the same as you would with a helicopter. This adds to the hazard.

The AV-8A, in addition to its high workload, is also a neutral stability aircraft in VTOL flight that has to be watched very carefully. A moment's inattention or distraction on the part of the pilot can lead to a hazardous situation.

Senator GOLDWATER. Have your test pilots done a thorough study of these accidents? Have you ever written a paper on why?

General WHITE. Yes, sir, we have. As as matter of fact, there have been numerous studies devoted to the subject of V/STOL safety. I can supply the committee with the written material that we have used in analyzing AV-8A accidents and the various elements that we have taken from analysis to make sure that the AV-8B is a good, safe, stable aircraft.

Senator GOLDWATER. I wonder if you could provide the committee with a sample of those studies? To be honest with you the trend now in this committee, the armed services committees of both houses, will be toward smaller aircraft carriers. V/STOL is going to become a very necessary aircraft, but if we are going to have the advanced one the first in accidents, it is going to be hard to sell.

I would like to know, frankly, a little bit more about it. I have been quite high on that AV-8. I have been very impressed with it. All of a sudden we get a high accident rate on it, and that will be one of the things that will get tossed to us by the people who want to cut the defense budget: Why buy this aircraft when the accident rate is so high?

It becomes difficult to answer unless we have all the facts.

Would you send us something we can look at and study?

General WHITE. Mr. Chairman, I will be happy to supply your needs in this regard.

[The information follows:]

ANALYSIS OF AVIATION SAFETY STUDIES OF AV-8A PROGRAM

U.S. MARINE CORPS, DEPUTY CHIEF OF STAFF FOR AVIATION, AVIATION SAFETY/NATOPS BRANCH; MARCH 15, 1982

The AV8A is the prototype aircraft in the totally new aviation concept of VSTOL light attack. Similar in many ways to the first jet aircraft and first helicopters, the AV8A has been successful in proving concept feasibility and demonstrating capabilities on an operational scale. The mishap rate, although high, is less than that of other tactical aircraft at the same level of experience in flight hours and sorties. The rate is less compared to aircraft which were departures from previously accepted norms such as the A4 and F8 and compares favorably with more modern but less revolutionary aircraft such as the A7, F-4, and F-14 at the same flight hour and sortie points.

Analysis of the primary causes of AV8A mishaps reveals that the high pilot workload in the transition to and from VSTOL flight and engine malfunctions are chief contributors. These conditions are not concept flaws and can be improved or corrected by application of modern technology. Such is the case with the AV8B. Pilot work-

load factors have been drastically reduced and all known engine design deficiencies have been or are being corrected through the engine component improvement program jointly funded by the U.S. Navy and Royal Air Force. With the inception of the AV8B, TAV8B and state of the art simulators, there is reason to be confident that the VSTOL concept will be as safe as it is tactically versatile and effective.

SYNOPSIS OF AVIATION SAFETY STUDIES OF AV-8A PROGRAM

Overview

The advent of the AV8A heralded a new departure in fixed-wing tactical aviation. The VSTOL capability of the aircraft was as revolutionary as the helicopter and the jet engine in their day. The Marine Corps saw the VSTOL concept as tailormade for its philosophy of close air support and the air-ground team.

Not only was the VSTOL concept revolutionary but the aircraft itself promised many unique and totally new challenges to the aviators and support personnel who were to operate it. Prudence and limited resources dictated that the Marine Corps embark cautiously on this enticing but risky endeavor. The first generation aircraft of any new concept is traditionally fraught with developmental problems and has proved to be dangerous and often unforgiving to its aviators. The first helicopters and jets progressed and matured only at the cost of many lives. More recently in the late fifties, the first light attack, nuclear capable jet aircraft, the A4, and the first supersonic fighter, the F8, proved costly until enough was known about those aircraft and their environment to educate and train pilots to recognize and avoid inherent pitfalls. The Marine Corps, being well aware of these dangers, set out to examine and hopefully introduce VSTOL aviation as a viable military concept as safely and inexpensively as possible.

The VSTOL program was conceived as essentially that of test, evaluation, concept development and limited fleet involvement throughout the life of the first generation aircraft. Should the concept prove valid, then through modifications of the first generation aircraft and design improvements in a second generation aircraft the Marine Corps would be prepared to embrace VSTOL on a large scale. The Marine Corps acquired 102 AV8A's to examine and fully explore the VSTOL concepts in light attack. Although a prudent course of action, the small buy brought with it the inherent problems of any small community: high initial unit cost, limited supply support, vulnerability to gross forms of statistical analysis, and high unit cost of modifications.

Throughout the life of the VSTOL program, it has been subject to close scrutiny and rigorous analysis. Aviation safety has played a major role in the decisions made throughout and has realized the same successes and frustrations experienced by all. Limited resources have not always allowed the modifications needed to make the first generation aircraft as safe as desired nor have management decisions always gone to the side of safety when balanced against real world requirements. Nevertheless, when taken in perspective, the first generation VSTOL tactical military aircraft has acquitted itself very well not only in proving a concept but also in its safety record. This can be better appreciated by quickly reviewing the program over the last 11 years from the standpoint of safety studies conclusions and recommendations made at each major decision point.

History

The AV8A service experience may be roughly divided into four phases.

Phase I, 1971—Introduction and Testing.

Phase II, 1971-73— Fleet Performance Evaluation.

Phase III, 1973-75—Program Expansion and Fleet Deployment.

Phase IV, 1976-81—Standard Fleet Operations and Concept Refinement.

During each phase and throughout the entire lifetime of the aircraft, the Marine Corps has closely monitored, evaluated and analyzed the aircraft, the VSTOL concept and the aviators involved. The results of each phase were balanced against goals and requirements and were primary factors affecting decisions in the program. The following paragraphs describe the aviation safety analyses, conclusions and recommendations by phase and resulting commend decisions and initiatives.

I. Phase I—1971—Introduction and testing

A. Analysis:

1. Engine performance considered satisfactory—Judged sensitive to specific gravity of fuel.

2. Conventional flight characteristics satisfactory—Handling and stability excellent.

3. VSTOL performance adequate—(a) Stability marginal—high pilot workload; (b) accelerating/decelerating transitions most critical phase of flight; and (c) YAW axis control of particular concern.

B. Conclusions:

1. Aircraft releasable to fleet on limited, controlled basis due to revolutionary concept and high pilot workload.

2. Product improvement required—(a) Engine reliability; and (b) VSTOL stability augmentation.

C. Recommendations:

1. Stability augmentation in YAW strongly recommended.

2. Improved 3-axis stability package recommended.

3. Fleet introduction be limited in size and scope with hand-picked aviators only in first squadron.

D. Decisions:

1. Continue program on limited scale.

2. Release to fleet for concept development—(a) One squadron only; and (b) experienced, exceptional aviators only.

3. Program and seek funding for product improvement—(a) Engine reliability, and (b) improved stability augmentation.

II. Phase II—1971-73—Fleet performance evaluation

A. Analysis:

1. The AV8A exceeded specifications and expectations in—(a) Sortie generation in Close Air Support; (b) optional basing modes; (c) air defense (Air-to-Air combat); (d) carrier suitability (day/VFR); and (e) mishap rate (zero through 2½ years).

B. Conclusions:

1. AV8A could be safely operated on a closely-controlled, limited basis in an operational environment.

2. AV8A had potential in previously unforseen areas—(a) Air defense; (b) extremely rapid and sustained sortie generation; and (c) lower carrier training requirements than CTOL.

3. Full potential of aircraft/concept not yet realized.

C. Recommendations:

1. Program expansion and fleet deployment be undertaken in a step-by-step manner.

2. TAV8A be procured for anticipated larger scale training requirements.

3. Separate training squadron be established to provide initial transition training without operational pressures.

4. Selection of pilots continue to be from top performers but be broadened and extended to inexperienced aviators.

D. Decisions:

1. Continue and expand program.

2. Form four squadrons and integrate throughout fleet including WestPac and carriers.

3. Form a training squadron.

4. Program and seek funding for TAV8A.

5. Expand public demonstration.

III. Phase III—1973-75

A. Analysis:

1. Original cadre dispersed to a total of 4 squadrons in 18 months.

2. Detachment deployments to WestPac and carriers.

3. Rapid increase operational requirements for ground support.

4. Supply support severely strained—Reduced pilot flight time

5. Increase in demonstration flights.

6. Influx of inexperienced pilots and more nearly "average" pilots.

7. Mishap rate increased—9 accidents (Figure 1)—(a) VSTOL related, 4 (44 percent); (b) conventional related, 3 (33 percent); (c) engine failure, 1 (1 percent); and, (d) other (bird strike), 1 (11 percent).

8. TAV8A not yet available—(a) 3 of 4 VSTOL mishaps involved inexperienced pilots; and (b) 3 of 3 conventional related mishaps were pilot error by inexperienced pilots.

B. Conclusions:

1. Expansion of program outpaced supply support and training capability.

2. Lack of upgraded 3-axis stability package resulting in high pilot workload makes transition to and from VSTOL flight hazardous to inexperienced pilots.

3. Lack of TAV8A limits identification of unsafe tendencies and ability to demonstrate or closely monitor high workload phases of flight.

4. Concept and aircraft still viable but without desired modifications program required careful management.

C. Recommendations:

1. TAV8A be introduced as rapidly as possible.
2. Operational commitments and deployments be reduced until training level and supply support can meet needs.
3. Modifications be pursued vigorously—(a) Improved stability augmentation; and (b) engine reliability.

D. Decisions:

1. Program continue to include expansion of operational commitments. To do otherwise would jeopardize entire program and ensure lack of funding for desired modifications.
2. Pursue improved/expanded supply support to meet increasing demands.
3. Introduce TAV8A in training squadron immediately.
4. Continue to seek funding for programmed modifications.
5. Continue careful screening of pilots.
6. Initiate design of second generation VSTOL aircraft based on AV8A experience and capitalize on lessons learned.

IV. Phase IV—1976-81—Standard fleet operation and concept refinement

A. Analysis:

1. Operational commitments continue to increase—(a) Full squadron and detachment carrier cruises; (b) standing WestPac detachment on unit rotation; (c) increased support to ground force training; and (d) inclusion in joint and combined exercises.
2. Supply support shortfalls rectified to acceptable level.
3. Most modifications not funded.
4. TAV8A introduced and used to capacity.
5. Mishaps continue at high rate (6-7/year) (Figure 1)—(a) VSTOL related, 9 (27 percent); (b) conventional related, 12 (37 percent); (c) engine failure, 11 (33 percent); and (d) other (jammed flt cont) 1 (3 percent).
6. Pilot error and VSTOL related mishaps occur predominantly to inexperienced AV8A pilots 18 of 27 (67 percent).
7. Available aircraft declining—(a) Attrition; (b) Overhaul; and (c) Conversion to AV8C.

B. Conclusions:

1. Air demonstrations not vitally necessary and an unproductive use of resources.
2. Pilot workload without stability augmentation modification is a major factor in VSTOL mishaps.
3. AV8A takes longer for pilot to become proficient once achieved, mishap rate is low.
4. Concept is proven, is viable and is understood sufficently to move forward to second generation aircraft and subsequent expansion of program.
5. Aging engines and airframes require substantial rework and modifications to continue as operational aircraft (AV8C conversion).

C. Recommendations:

1. Air demonstrations be drastically reduced or eliminated.
2. Revise training and OP TEMPO to accomodate longer training time.
3. Pursue AV8B program as solution to AV8A identified shortfalls.
4. Convert AV8A to AV8C with incorporation of modifications to reduce pilot workload and improve engine reliability.
5. As part of AV8B program procure TAV8B and simulators commensurate with other Navy and Air Force single-seat aircraft.

D. Decisions:

1. Air demonstrations for the public have been reduced to almost zero.
2. AV8 training under study and subsequent revision.
3. AV8A to AV8C conversion ongoing. However, pilot workload modifications are not funded.
4. AV8B program with TAV8B and simulator programmed in proposed fiscal year 1983 budget.
5. OPTEMPO capped. No new commitments without commensurate reduction elsewhere.

CONCLUSIONS

Since its inception, the light attack VSTOL program has been a revolutionary and unquestionably successful endeavor. The AV8A as the prototype in this new departure from conventional concepts has performed its purpose of proving feasibility,

demonstrating capabilities on an operational scale and identifying design deficiencies and training requirements. These steps have all been accomplished prior to purchase of a second generation aircraft and expansion of the commitment.

The safety record of the AV8A provides ample evidence that the problems uncovered are those normally expected of a first generation aircraft in a totally new concept and not problems with the concept itself nor in correcting the shortfalls in the prototype aircraft. As described earlier, the mishap rate of the AV8A compares favorably with other new tactical jet aircraft and is better than any other aircraft representing a significant departure from what has gone before (Figures 2 and 3). In other areas the AV8A compares equally well. For example: the AV8A has logged over 4,000 hours and 7,000 landings aboard CV's, LHA's, LPH's and aircraft-capable ships. There has never been a landing accident and since fleet introduction, only one Marine Corps takeoff accident.

The design modifications that must be incorporated in follow-on VSTOL aircraft deal primarily with reduction of pilot workload in the transition to and from the VSTOL environment, and improved engine reliability. Both areas have been addressed rigorously in the design of the AV8B. Aerodynamic design improvements such as (1) reduction of the thrust borne to wing borne transition phase of flight from a 60 knot band in the AV8A to a 12 knot band in the AV8B, and (2) incorporation of a fully active state of the art Stability Augmentation Attitude Hold System (SAAHS) have been successfully demonstrated in the AV8B, an easy to fly aircraft. Purchase of the TAV8B and modern flight simulators will provide the tools essential for safe transition into an all-VSTOL light attack force.

There is still room for improvement in the management of our on-going AV8A training and fleet employment. These are continuously under review and, regretfully, are even more pressing since the pilot workload reduction modifications in the AV8B were not funded in the AV8C CILOP program. As in every new program, the lessons learned through experience are used to improve and build upon that which has gone before. Careful analysis of lessons learned and the new initiatives we have taken indicate that the AV8B will be highly significant step forward with a proven concept while removing the high risk areas identified in the concept prototype AV8A.

Summary

The AV8A is the concept prototype aircraft in the totally new operational concept for VSTOL light attack. Similar in many ways to the first jet aircraft and first helicopters, the AV8A has been very successful in proving concept feasibility and demonstrating capabilities on an operational scale. The mishap rate, although high, is less than that of other tactical aircraft at the same level of experience in flight hours and sorties. The rate is less compared to aircraft which were departures from previously accepted norms such as the A4 and F8 and compares favorably with more modern but less revolutionary aircraft such as the A7, F-4, and F-14 at the same aggregate flight hour and sortie points.

Analysis of the primary causes of AV8A mishaps reveals that the high pilot workload in the transition to and from VSTOL flight and engine malfunctions have been the chief contributors.

These conditions are not concept flaws and can be improved or corrected by application of modern technology. Such is the case with the AV8B. Pilot workload factors have been drastically reduced and all known engine design deficiences have been or are being corrected through the engine component improvement program jointly funded by the U.S. Navy and Royal Air Force. With the inception of the AV8B, TAV8B, and state of the art simulators, there is reason to be confident that the VSTOL concept will be as safe as it is tactically versatile and effective.

USMC AV-8A MISHAP RATES 1971-1981

MISHAPS INVOLVING SUBST OR STRIKE DAMAGE

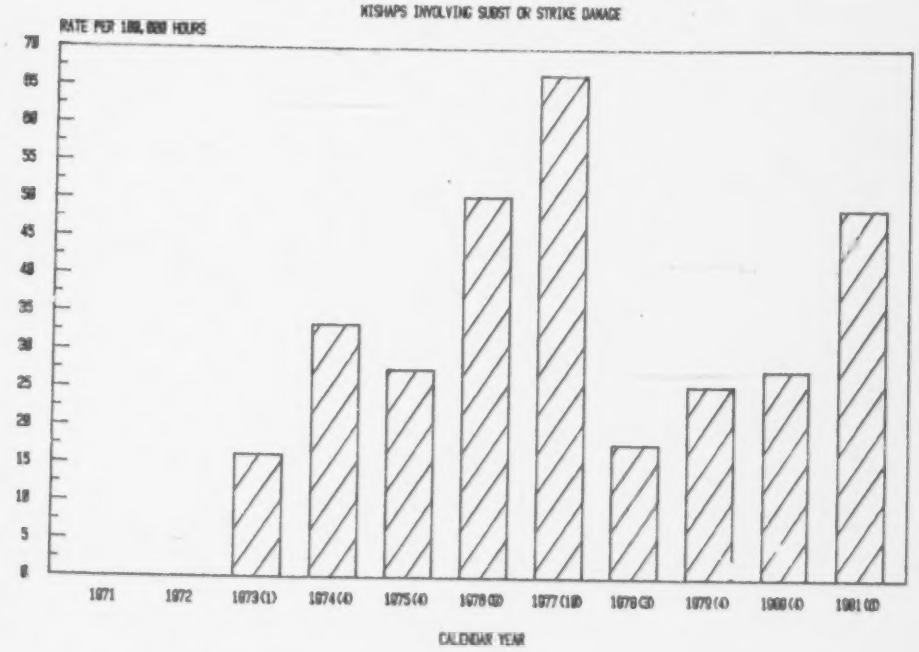


FIGURE 1

COMPARATIVE CLASS-A MISHAPS VS SORTIES

FIRST 135,000 SORTIES DERIVED

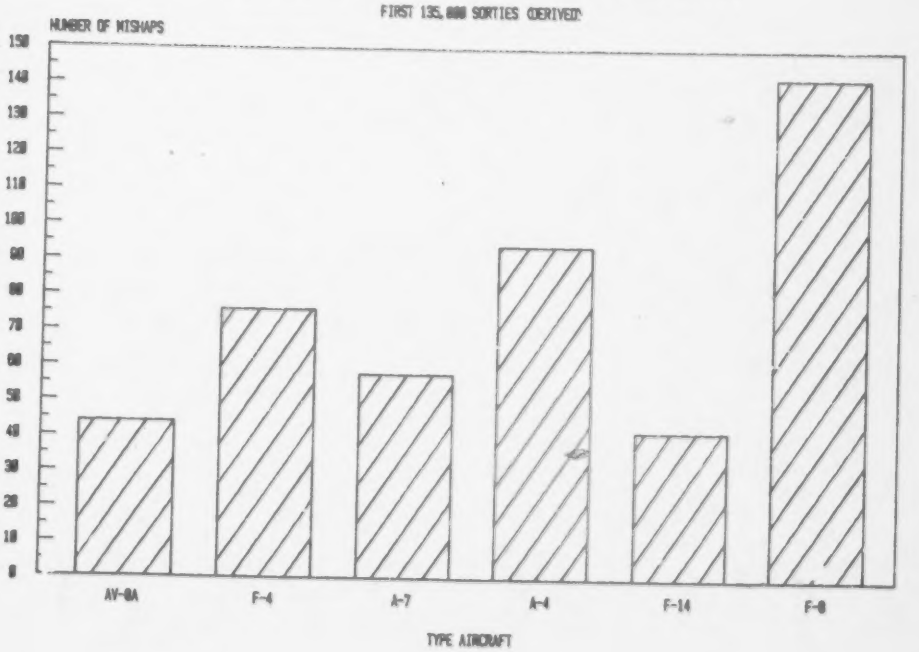


FIGURE 2

COMPARATIVE CLASS-A MISHAPS VS FLT HOURS

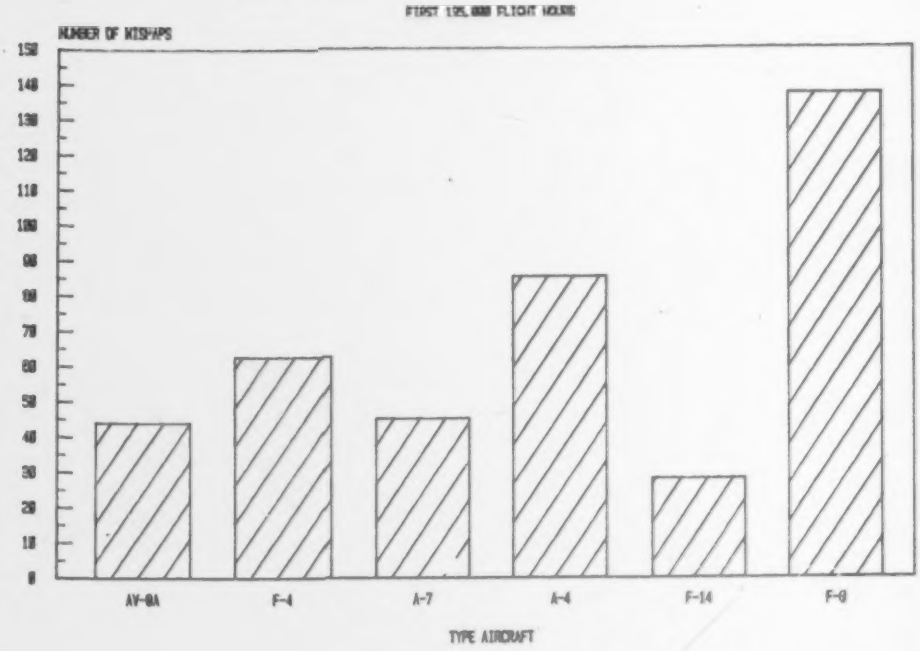


FIGURE 3

MISHAP CAUSE FACTOR SUMMARY (1971–81)

[Enclosure 1]

Cause factor	Mishaps	Fatalities
Flight test mishaps (4):		
Pilot error	2	2
VSTOL	(0)	.....
Conventional	(2)	(2)
Material failure	0	0
Engine	(0)	.....
Maintenance error	2	0
Engine	(1)	.....
Other	0	0
Total	4	2
USMC mishaps (44):		
Pilot error	29	14
VSTOL	[1] (14)	(6)
Conventional	(15)	(8)
Material failure	9	1
Engine	(9)	(0)
Maintenance error	5	0
Engine	(3)	.....
Other	1	.....
Bird strike	(1)	.....
Total	44	15

[1] 9 during transition flight.

RESUME OF AV-8A MAJOR MISHAPS (1971-81)

[Enclosure]

Date and location	Damage	Injuries	Circumstances
Flight test mishaps (4):			
June 18, 1971—NAVAIRSYSCOM	Strike	Fatal	Inflight; weapons test; low pull out; water impact; pilot error.
Nov. 15, 1979—YAV-8B prototype	do	None	In flight; faulty ignition; system wiring; maintenance; pilot error.
Sept. 5, 1980—NAVAIRSYSCOM U.S.S. "Tarawa".	do	Minor	Takeoff; (VSTOL) engine failure; fuel control; not core engine; maintenance.
June 20, 1981—NAVAIRSYSCOM—U.S.S. "Tarawa".	do	Fatal	Fly by; pilot error; supervisory.
USMC mishaps (44):			
Mar. 21, 1973—Beaufort, S.C	do	Major	Inflight; bird strike; unavoidable.
June 5, 1974—New River, N.C	do	Fatal	Landing; (VSTOL) approach; pilot error.
July 27, 1974—Milwaukee, Wis	do	Major	Hover (VSTOL); pilot error.
Oct. 8, 1974—Cherry Point, N.C	Substantial	None	Landing; rollout; pilot error.
Oct. 9, 1974—Cherry Point, N.C	Strike	Fatal	Landing; rollout; pilot error.
Feb. 13, 1975—Cherry Point, N.C	do	do	Take-off; (VSTOL) undetermined; pilot error.
July 3, 1975—Cherry Point, N.C	do	Major	Inflight; low level; engine failure bevel gear not core engine.
Do	do	Fatal	Inflight; low level; stall pilot error.
Oct. 30, 1975—Cherry Point, N.C	Substantail	None	Landing; (VSTOL) pilot error.
Jan. 10, 1976—Jacksonville, Fla	Strike	Minor	Landing; (VSTOL) approach pilot error.
Apr. 17, 1976—Yuma, Ariz	Substantial	do	Landing; gear-up; pilot error.
May 27, 1976—Quantico, Va	do	None	Take-off; (VSTOL) pilot error.
June 15, 1976—U.S.S. "Roosevelt"	Strike	do	Inflight; engine failure; LP compressor core engine.
July 29, 1976—Cherry Point, N.C	Substantial	Major	Landing; (VSTOL) pilot error.
Dec. 16, 1976—Iwakuni, Japan	Strike	Fatal	Inflight; disorientation; pilot error.
Feb. 11, 1977—Wilmington, N.C	do	None	Inflight; fuel exhaustion; pilot error.
Mar. 19, 1977—Beaufort, S.C	do	do	Take-off; (VSTOL) transistion; pilot error.
Apr. 6, 1977—Beaufort, S.C	do	Fatal	Take-off; (VSTOL) transistion; pilot error.
Apr. 18, 1977—Cherry Point, N.C	Substantial	None	Landing; (VSTOL) butterfly valve; maintenance.
July 12, 1977—U.S.S. Saratoga	Strike	Fatal	Inflight; weapon delivery; water impact; pilot error.
July 26, 1977—Cherry Point, N.C	do	do	Tactical formation; water impact; pilot error.
Aug. 29, 1977—Cherry Point, N.C	do	None	Take-off; engine failure; core engine; maintenance.
Sept. 6, 1977—Nellis, Nev	do	Fatal	Inflight; close air support; ground impact; pilot error.
Nov. 28, 1977—Kadena, Okla	do	None	Landing; (VSTOL) pilot error.
Nov. 29, 1977—Kadena, Okla	do	do	Inflight; engine failure; suspect compressor; core engine.
Feb. 1, 1978—Fallon, Nev	do	do	Inflight; engine failure; compressor; core engine.
Oct. 2, 1978—Yuma, Ariz	do	Fatal	Inflight; weapon delivery; pilot error.
Oct. 6, 1978—Yuma, Ariz	do	None	Inflight; engine failure; turbine; core engine; maintenance.
Aug. 6, 1979—Cherry Point, N.C	do	Major	Inflight; engine failure; bearing: core engine.
Oct. 12, 1979—29 Palms, Calif	Substantail	Minor	Inflight; engine failure; diaphragm; core engine; maintenance.
Oct. 12, 1979—Cherry Point, N.C	Strike	Fatal	Inflight; undetermined; pilot error.
Dec. 11, 1979—Yuma, Ariz	do	Minor	Take-off; engine failure; compressor; core engine; FOD suspected.
Mar. 13, 1980—Cherry Point, N.C	do	Fatal	Take-off; (VSTOL) pilot error.
Apr. 7, 1980—Yuma, Ariz	do	None	Inflight; foreign object jamming flight control; maintenance.
May 1, 1980—Cherry Point, N.C	do	Fatal	Take-off; (VSTOL) pilot error.
Aug. 1, 1980 (TAV-8A)—Cherry Point, N.C.	do	None	Inflight; engine failure; turbine; core engine.
Jan. 19, 1981—Cherry Point, N.C	do	Fatal	Take-off; (VSTOL) transition; pilot error.
Jan. 25, 1980—Yuma, Ariz	do	None	Inflight; supervisory; pilot error.

RESUME OF AV-8A MAJOR MISHAPS (1971-81)—Continued

[Enclosure]

Date and location	Damage	Injuries	Circumstances
Feb. 26, 1981—Cherry Point, N.C.	do	do	Take-off; engine failure fan; core engine.
Mar. 18, 1981—Cherry Point, N.C.	do	do	Take-off; (VSTOL) pilot error.
Apr. 20, 1981—U.S.S. "Nassau"	do	Minor	Take-off; supervisory; pilot error.
Dec. 3, 1981—29 Palms, Calif.	do	Fatal	Inflight; ground attack; pilot error.

General WHITE. I might point out, if I may, another comparison that may assist you in assessing where we stand on the AV-8 accident rate. You have to understand that the Harrier, by the nature of its operation, will fly two and three times the number of sorties that a conventional fixed-wing aircraft will fly; therefore, it is engaged in more landings and takeoffs per day than a conventional aircraft. So, if we related our accident rate to a sortie rate, that is, if all the Armed Forces computed their safety on a sortie rate, you would find the AV-8 is comparable with other tactical aircraft.

I don't think that has been fully appreciated.

There are other considerations in this. If you go back and trace the initial history of your new aircraft, recognizing that we have only had the AV-8 for the last 11 years, and you compare the F-4, the F-8 and other tactical aircraft, at the same point in their history, you will find that the AV-8 has a comparable safety record.

The other point I would make in all of this is that we are experiencing approximately the same safety rate as the RAF, which is the only other service in the world that operates this aircraft, recognizing that the RAF has had 2 years' more experience than we have.

Senator GOLDWATER. Yes, but your accident rate has not gone down; it has been coming up; you have been down as low as 9; now you are up to 57. I don't want to belabor this. It is a point that we have to have an answer for. As you know, we are going to have a hard time holding this budget where we want it.

I have an ex-Navy pilot here and my assistant is an Air Force F-4 pilot. I wonder if you could give them a ride in this bird, either scare them or let them see how it flies?

General WHITE. We will be happy to provide a Harrier ride to any who would like to have a flight.

Senator GOLDWATER. We will get into this later on.

General WHITE. I was discussing the F/A-18, built by McDonnell Douglas. That is to say, substantial progress has been made with the F/A-18 program in the modernization of our Marine fighter attack squadrons, and that is taking place. Our first F/A-18 squadrons will turn in their old F-4 Phantoms next month in preparation to go to NAS, Lemoore, where on July 1 they will start their F-18 transition.

Incidentally, two other squadrons will follow that first one at 2-month intervals.

Senator GOLDWATER. You won't get your first planes until January of 1983?

General WHITE. About Christmastime of this year we will receive our aircraft. We leave El Toro on July 1 with our first squadron.

Senator GOLDWATER. Is the Navy being stingy with you?

General WHITE. No. For the first time in my memory we are getting the first crack at new aircraft.

Admiral MCDONALD. The Marine Corps is standing up their squadrons first. The first three will be Marine squadrons.

Senator GOLDWATER. Have any of the Marines actually flown it?

General WHITE. Yes, sir; they have.

Senator GOLDWATER. And they like it?

General WHITE. Yes, indeed. I would hasten to add I have talked personally to Marine pilots who have been flying aircraft fully involved in the testing and development of this aircraft and now in the joint training squadron at Lemoore, and they are very excited about this aircraft.

What is more, I have talked to the maintenance NCO's and maintenance petty officers, the men who have to turn the wrench to maintain this aircraft. They are truly delighted to find they have an aircraft that only requires one-half the maintenance effort of the old F-4 Phantoms.

Mr. PAISLEY. Mr. Chairman, I went out about 3 weeks or 1 month ago with the Secreary of the Navy. We both went up in the F/A-18, separately, and we went up in the F-4 and went out on a 1½-hour mission. It was an attack on a dam up by Edwards. Then we got into a 15-minute dogfight. I might tell you it was delightful. I went out with a Marine pilot, a young captain. You know, I guess it is just a habit of the business, but once you start flying an airplane there does not seem to be any other airplane. That is the way it is.

The Secretary has been so in love with the A-6, and with that one flight in the F/A-18 I think I am going to make an F/A-18 pilot out of him. The crowd is very enthusiastic for the airplane.

I was particularly happy with the displays that are in the airplane. It has an unbelievably good display system in that heads up display that gives you the capability to see the performance of the airplane in terms of the instrument output at the same time you are running a mission.

I might say I am very enthusiastic about it.

The trouble is, I would like to get more time in it, and they want me to work all the time.

Senator GOLDWATER. Admiral, when we flew that bird, as I recall, the only thing it had that might be unpleasant was a tendency to stall at a high angle of attack, particularly in a climb, turning to the left. Has that been overcome?

Admiral MCDONALD. Yes, sir. I don't remember that specific deficiency, Mr. Chairman. [Deleted.] It is still in the developmental phase of the airplane.

Mr. PAISLEY. Let me say something about it, because I got into that maneuver when I was flying it. It was a tight turn to the left in a dogfight. I thought that I was going through a stall. This young Marine pilot said: "Don't think you are in a stall; this is just a characteristic. If you either pull through it or back off of it slightly, you will shake it off."

I am not sure it is a stall characteristic at all. Anyhow, I know the feeling you are talking about. The thing that delighted me was that you could fly that airplane from very low speed to very high

speed and the feel of the airplane does not change; it was very interesting.

Admiral McDONALD. Commodore Weaver might have an explanation for that, Mr. Chairman.

Commodore WEAVER. In our flight control computer, which the Secretary was flying, and you were flying, the flight control computer program 5 series, we did have a tendency to have a slight instability from [deleted] degrees angle of attack. That is eliminated with a 6 series program. [Deleted.] We see it fully compatible with the attack role. Once you complete your attack and drop the stones, you have the full-fighter capability.

Senator GOLDWATER. As you move your center of gravity forward to use it in an attack role and as you begin to pull out will it come out immediately, or does it have a tendency to sort of squat down?

Commodore WEAVER. Of course, if you are descending and making a dive, it will squat down slightly. We have good stabilizer control comparable to the A-7, slightly better. The pitch rate on this aircraft is superb by virtue of the high moment generated by the stabilizer.

Senator GOLDWATER. That is one of the problems that the F-15's had originally. When you wanted to come out of your attack it does not want to do it right away. It does not hurt, but can certainly scare you.

General WHITE. I will turn next to our AV-8B, which is the centerpiece of the modernization of our Marine light attack effort.

I think you will be pleased to hear that basically the AV-8B Harrier program is on schedule and on cost. Since last year's hearings, four full-scale development aircraft have been built by McDonnell Douglas. The first of these aircraft flew on the 5th of November 1981. Since that historic flight, we have had 10 other highly successful flights.

As I said a moment before, the test pilots are very vocal in praising the superb handling qualities of this aircraft. We take these aircraft to Patuxent River in April to start their initial tests. Operational evaluation is scheduled to start in August 1983.

From the precise manner in which these initial milestones are being achieved, we have a very great confidence that our planned IOC in September of 1985 will be met on time.

Our only remaining area of concern regarding the AV-8B program is development of a two-seater version of the AV-8B for pilot training. We foresee the need for a two-seater in the fiscal year 1986 timeframe to properly handle the heavy pilot training load as we transition pilots from the more conventional attack squadrons into our new V/STOL squadrons.

Both the Navy and the Marine Corps staffs are working on this problem as part of the formulation of the fiscal year 1984 budget.

Before I leave the AV-8B program, I would be remiss if I did not again express my personal and the Commandant's appreciation for this truly splended support we have received for this Marine Corps program.

So far, I have discussed mature, ongoing, fully established programs. I would now like to outline for you a very important helicopter modernization effort which is only now getting into the formative stage.

For several years the Marine Corps has been seeking a suitable replacement for its aging fleets of CH-46 and CH-53A/D transport helicopters. Replacement has become a critical consideration because, first of all, we have an inventory shortfall which right now limits our ability to meet our amphibious lift requirements and each year normal attrition takes its toll.

Second, these aircraft, due to their age, are experiencing increasing cost of ownership. Another way of saying it is that they have become expensive and difficult to maintain.

Finally, in our opinion, they lack the survivability and performance criteria needed on today's battlefield.

For these reasons, the Commandant has made the replacement of those aircraft as his No. 1 aviation priority program.

We in the Marine Corps, with the help of the Navy, are pursuing two approaches, one a long term and the other a short term, to find resolution of this problem. In our long-term approach we are actually participating with the Navy, the Army and the Air Force in the establishment of a joint-service program to produce an advanced vertical lift aircraft now designated the JVX, and to do so by the 1990's.

We believe that a variation of that JVX aircraft has the potential of fulfilling our medium transport requirement.

In our short-term approach we are planning to procure an off-the-shelf helicopter as soon as possible to cover our inventory shortfalls until the JVX becomes a reality.

I will conclude my remarks by attempting to tie together these various modernization programs I have been talking about and relate them to their impact on our Marine Reserve component, the 4th Marine Aircraft Wing.

Delivery of each one of these new aircraft systems to our regular establishment gives us the opportunity to upgrade our Reserve squadrons with more modern and more combat-capable aircraft.

For example, introduction of the F-18 into the active structure will free up a sizable number of the most modern series of F-4's to let them migrate into our Reserve Fighter Attack Squadrons. In turn, the AV-8B will provide the same benefit by releasing the A-4M, which is still a combat-capable aircraft, and let them go into our Reserve Attack Squadrons.

Our modernization program, although designed for the Active Establishment is paying double dividends with our Reserves as well.

Mr. Chairman, that concludes my statement. I will be happy to answer any questions you may have.

[The prepared statement of General White follows:]

PREPARED STATEMENT OF LT. GEN. WILLIAM J. WHITE, U.S. MARINE CORPS, DEPUTY CHIEF OF STAFF FOR AVIATION

Mr. Chairman, Distinguished Members of the Committee, it is a privilege to once again address the committee on the state of Marine Aviation. During the past year, we have made significant progress toward increasing our combat capabilities and I thank the committee for the strong support which has made this possible. I am pleased to report that we are beginning to place new weapons systems in the hands of our Marines in the field and, by all indications, these systems are working well. At this time, I would like to discuss several aviation programs of particular importance to the Marine Corps.

Marine Aviation's number one modernization program today is a replacement for our aging medium helicopter force of CH-46 and CH-43A/D aircraft. These helicopters suffer from several problems which make planning for their timely replacement a critical necessity. First, we have an inventory shortage which limits our ability to meet our current medium lift requirements. Second, these helicopters, due to their age, have an ever increasing cost of ownership. Third, these airframes lack the survivability and maintainability of current generation aircraft. Finally, the heavier future lift requirements of the Marine Amphibious Force require a more capable assault transport aircraft. For these reasons, solutions to our assault vertical lift dilemma must be undertaken without further delay. The Marine Corps is pursuing this solution by two approaches. First, we are participating in the establishment of a joint service program designed to produce an advanced vertical lift aircraft, designated JVX, by the early 1990s. A variation of this aircraft has the potential of becoming the Marine Corps' medium assault transport. Second, we are planning procurement of off-the-shelf helicopters as a means of providing a suitable interim remedy to our medium lift shortfall until a replacement advanced vertical lift aircraft becomes a reality. Funding requested in fiscal year 1983 will enable us to proceed with both approaches to our medium assault lift solution.

As in past years, the AV-8B Harrier program continues to be the key element in the Marine Corps' modernization of its light attack force. The Committee will be pleased to hear that the Harrier program is proceeding on schedule. Since last year's hearing, four Full Scale Development (FSD) aircraft have been built. The first AV-8B FSD model flew on November 5, 1981. That flight and 10 subsequent flights have all been highly successful. FSD aircraft will proceed to Naval Air Test Center (NATC), Patuxent River, Maryland, in April to begin initial testing with operational evaluation (OPEVAL) scheduled for August 1983. The planned Initial Operational Capability (IOC) of 1985 is on schedule. Our only area of concern is the resolution of training requirements which will be generated by the AV-8B's replacement of the A-4M. This problem is currently under study. With the procurement of 18 AV-8B's requested in fiscal year 1983, we will take another positive step toward our goal of an all V/STOL light attack force.

Thanks to substantial progress in the F/A-18 Hornet program modernization of our Marine fighter-attack (VMFA) force will actually begin in July when VMFA-314 proceeds to NAS Lemoore, California for six months of F/A-18 transition with VFA-125, our joint Navy-Marine F/A-18 training squadron. VMFA-314 will return to MCAS EL Toro, California, in January 1983, where it will receive its full complement of 12 F/A-18s. The squadron will be joined by two other squadrons, VMFA-323 standing up in October 1982 and VMFA-531 in January 1983. This will enable the Marine Corps to field the first three operational F/A-18 squadrons by the end of fiscal year 1983. The Navy and Marine Corps have agreed to develop a capability to deploy two Marine Corps F/A-18 squadrons by January, 1984, should the need arise. This capability will be attained just 12 months after the first operational F/A-18 squadron has completed initial training, and we believe it to be a major logistic as well as operational milestone.

The F/A-18 will clearly provide Marine Aviation with significantly enhanced combat superiority, both as a fighter and attack aircraft, over the F-4 that it replaces. The reports from VFA-125 pilots and maintenance personnel not only herald the F/A-18 as a first rate fighting machine but also indicate that the aircraft is equaling or exceeding all reliability and maintainability specifications. This is welcome news indeed to the Marine Corps and all of Naval Aviation.

In spite of all the good news about the F/A-18, we do have one area of concern: RDT&E funding. In fiscal year 1982, we note a $35M shortfall which will cause significant delays and reductions in the air to ground attack capability test program at Patuxent River. In the long term, the testing will be completed, and the Hornet will achieve its full potential as an attack aircraft. In the short term, however, delays in fiscal year 1982 testing will result in aircraft being delivered to Marine squadrons in 1983 with less than desired capability.

Another new aircraft which is proving its worth every day in the Fleet Marine Force is the CH-53E Super Stallion. Our first CH-53E squadron, HMH-464 is now operating from MCAS(H) New River, North Carolina, with its full complement of 15 aircraft. Our second 53E squadron was activated in December 1981 at MCAS(H) Tustin, California, and received its first aircraft in February 1982. By all accounts, the CH-53E is a bonafide operational success. Reports from HMH-464 pilot indicate that the performance of the CH-53E is exceeding our original expectations. Since receiving its first aircraft in June 1981, the squadron has routinely lifted 14.5 ton practice loads and supported our ground Marine units at Camp Lejeune, North Carolina, in a variety of operations. Additionally, the squadron will be participating

in operational test of several Light Armored Vehicle (LAV) candidates this spring at the Marine Corps Air Ground Combat Center at 29 Palms, California. The 11 CH-53Es requested in fiscal year 1983 will be used in outfitting our third CH-53E squadron which we plan to establish in fiscal year 1985. These first three squadrons will minimally meet our current heavy lift requirements for the ship to shore movement of the M-198 Howitzer (8 tons) and its prime mover (12.5 tons). With the introduction of the LAV (14.5 tons) into the Fleet Marine Force, total heavy lift requirements for the ship to shore and subsequent operations ashore missions will more than double the number of CH-53E squadrons required to meet the demand.

Another important helicopter program addressed in the fiscal year 1983 budget is the AH-1T Cobra. There is 17.2 million dollars in long lead procurement funds requested for what is essentially an off-the-shelf purchase of 22 AH-1Ts in fiscal year 1984. These attack helicopters plus an additional 22 planned for procurement in fiscal year 1985, are needed to rectify a severe attack helicopter deficiency in both our active and reserve Marine aircraft wings. The AH-1Ts being procured will be capable of firing the Sidewinder missile as well as anti-tank weapons which will give them a new air to air capability as well as a much enhanced anti-tank capability. Both of these added capabilities are clearly needed to counter the serious threat posed by the Soviet Hind-D helicopter and armored columns.

Because of the magnitude of the Soviet tank threat, Marine Aviation has focused its attention on Precision Guided Missiles (PGM) which can successfully engage enemy armor at standoff distances. We believe the Hellfire and Laser Maverick are two such PGMs which can take on the threat and beat it without unacceptable aircraft attrition.

Hellfire is being procured for eventual use by our attack helicopter force. The great tactical advantage of the Army developed Hellfire missile over the TOW is in the survivability it offers the attacking aircraft. Our pilots will be able to fire the laser guided Hellfire at a tank which is laser designated by the ground commander and then break away before entering the tank's anti-aircraft killing zone. With the TOW, the aircrew must remain practically stationary while guiding the missile to the tank thus setting up an aircraft—tank version of a "High Noon" shootout with the battle being decided by whoever is quicker on the draw. Our AH-1/Hellfire IOC of fiscal year 1986 will provide the ground commander with much needed additional tank killing punch.

On the fixed wing side of Marine Aviation, Laser Maverick promises to offer the same type of aircraft survivability to our AV-8B, F/A-18 and A-4M aircraft that the Hellfire will provide to the attack helicopters. It also offers tremendous target lethality with its unique 300 pound warhead, the largest on any U.S. anti-tank PGM. Even a near miss from this weapon will be able to pulverize the most heavily armored Soviet tank and other hard surface targets. By providing the fixed wing community with an anti-tank weapon which the ground commander can control by laser designation, Laser Maverick furnishes additional safety for friendly forces which is so crucial in the type of close air support which Marine air provides for Marines on the ground. With operational testing commencing in March 1982, Laser Maverick's planned IOC of fiscal year 1985 looks solidly achievable.

In addressing the preceding weapons systems, I have forecast substantial modernization for our active structure, however, I should emphasize that this modernization also provides an important opportunity for us to upgrade the Marine Corps' reserve aircraft wing. For example, the introduction of new AH-1Ts into the active structure will free sizeable numbers of AH-1J helicopters to migrate into the Reserve component. The AV-8B will provide the same benefit by releasing A-4Ms equipped with the Angle Rate Bombing System (ARBS) and Laser Maverick to the Reserves. The transition to the F/A-18 will have the same effect on the Reserve fighter squadrons. Thus, as we improve the capabilities of our active Marine aircraft wings, we improve our Reserves as well and the dividends we receive are doubled.

This concludes my formal remarks. At this time, I am ready to answer any questions you may wish to ask.

Senator GOLDWATER. Thank you, General.

I have just one question: The night attack capability of the AV-8B is limited to laser spot. The AH-1T also has minimal night capability. How will the Marines conduct night combat operations with aviation assets that have such limited nightfighting capability?

General WHITE. We have in our inventory five squadrons of the A-6E to be equipped with the TRAM, which gives it the opportunity to acquire and designate attack targets at night.

As for helicopters, we have with our AH-1T FACTS program planned for, FLIR augmented Cobra TOW sight to provide the opportunity for the helicopter pilot to attack enemy targets with a TOW weapon system at night.

Senator GOLDWATER. Have you looked at the AH-64 at all?

General WHITE. Yes, I have, Mr. Chairman. We have a good deal of interest in it in the Marine Corps. I have flown the AH-64. I am very much impressed with the aircraft. Also, thanks to the help of Admiral Seymour, we sent a team of specialists out to the Yuma Proving Ground last September to take a close look at the aircraft, to see how it meets Marine corps requirements. We have a continuing interest in this aircraft.

Our concern is one of affordability. We would like to see how the price is going to come out before making a definite decision. There is $17.2 million of long lead funding in this budget we are considering right now for the purchase of 44 AH-1T's. We would like to make sure that we complete that purchase before we move on to something more sophisticated.

In saying that, I am certainly not downgrading in any way the ability of the AH-64; it is a very impressive helicopter from the standpoint of the sensors it provides the pilot and from the standpoint of the weapon system, the Hellfire missile.

Senator GOLDWATER. I flew it. I am very impressed with it. I think it probably will be the best military helicopter we have ever developed; however, we have a price problem. We now have Hughes and the Army working on that. While I can't give you a definite report, I think they are making some progress.

One of their big problems, of course, is the cost of their night infrared sight, which is a fabulous thing but we may have to get along without it.

I am glad to hear you are interested in it. We hope that we can buy them if the price gets down to where we think it should be.

Thank you very much, General.

Admiral MCDONALD. Mr. Chairman, with your permission, I would now like to go through the individual program reviews for you and provide the slides for your perusal and discuss any questions you might have on any one specific program, sir.

Senator GOLDWATER. You are the boss.

Admiral MCDONALD. This year we have been asked by your staff to come up with a common format that would be used in the Air Force hearings, and I would presume in Army aviation hearings, that will help put the large amounts of information you have to receive in basically the same format. We have tried to do that.

I will be showing you some slides which are new to us this year but hopefully will be in line with what you will be seeing from the Air Force later this week, and with any other presentations relative to aircraft procurement.

Admiral MCDONALD. As you will note, on your left is a slide which describes the aircraft, then on the right is the program cost information slide. The one over here on your left has a picture of

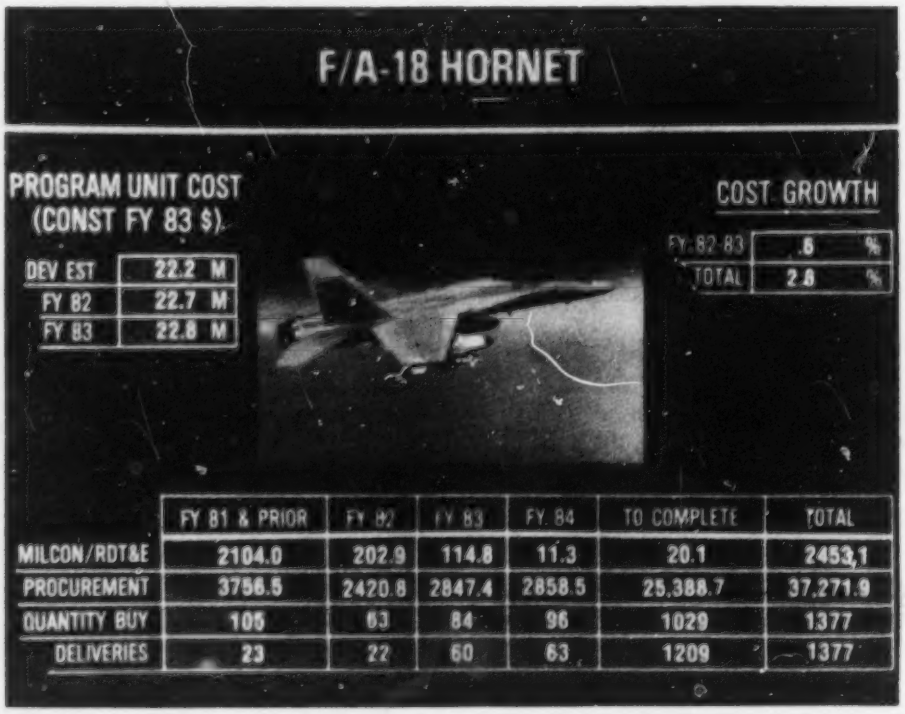
the aircraft and describes what that airplane's mission is, what we hope it will do, what we think it can do well.

Then, of course, the dollar slide is on your right.

Where appropriate, we will display program unit cost for those programs documented by congressional selective acquisition reports—SAR's. For established aircraft programs that are no longer documented by SAR information, we will switch to a display of only procurement unit cost.

In both cases, we will highlight the issue of cost growth.

For SAR programs, we have expressed program unit cost in constant fiscal year 1983 dollars to normalize the effects of inflation over the life of the program. For non-SAR programs I will display simple unit cost comparisons between fiscal years 1982 and 1983.


F/A-18 HORNET
PROGRAM UNIT COST
(CONST FY 83 $)
DEV EST 22.2 M
FY 82 22.7 M
FY 83 22.8 M
COST GROWTH
FY 82-83 .6 %
TOTAL 2.8 %
FY 81 & PRIOR | FY 82 | FY 83 | FY 84 | TO COMPLETE | TOTAL
MILCON/RDT&E | 2104.0 | 202.9 | 114.8 | 11.3 | 20.1 | 2453.1
PROCUREMENT | 3756.5 | 2420.8 | 2847.4 | 2858.5 | 25,388.7 | 37,271.9
QUANTITY BUY | 105 | 63 | 84 | 96 | 1029 | 1377
DELIVERIES | 23 | 22 | 60 | 63 | 1209 | 1377

Admiral McDONALD. As you can see in the data slide on your right, which is for F/A-18, the current year request is highlighted in orange flanked by the approved 1982 program and our forecast for fiscal year 1984.

On either side of those columns is the historical and future program data, and the total program projection is on the farthest right column.

Displayed to the left of the photograph are expressions of program unit cost in constant fiscal year 1983 dollars.

On the right, a very simple percentage growth comparisons from last year and over the life of the program.

Senator GOLDWATER. Let me ask you something, Admiral. Do your program managers keep you apprised of any indications they get from the manufacturer of a possible increase in cost?

Admiral McDONALD. Yes, sir, we get that almost all the time. Of course, it is hard to quantify what that is until we get the selective acquisition reports but we have an indicator as to what is happening, Senator, and we try to take those kinds of management actions that are available to us in the near term to try to—if it is purely a production problem, as in this case with McDonnell Douglas or Northrop—to address those things early on, so that they don't get out of hand.

Senator GOLDWATER. Does the manufacturer work with your program managers and the other way around?

Admiral McDONALD. Yes, sir.

Senator GOLDWATER. You can get an early indication that there is an increase coming?

Admiral McDONALD. Yes, sir, we like to believe this is monitored very closely. We have a representative of the Navy at the plant who is watching this very closely. Then, of course, in the case of the F/A-18, Commodore Weaver really owns part of the airplanes that fly between Washington and St. Louis, discussing programs with Mr. McDonnell and other members of the corporation, to see where we are in that program all the time. He probably has worked closer with Mr. George Graff, who has been the president of the aircraft company, as far as development is concerned; and he does the same thing with Northrop in the Hawthrone area.

We try to maintain that close relationship. When we see problems arising we send teams out to take a look at what is developing.

Senator GOLDWATER. I wish you would let us know anytime you sense a possible increase. I think it would work to the advantage of the Navy to let the manufacturer know that we are being told those figures, not waiting until the end of the year.

Admiral McDONALD. I appreciate your comment, sir. We will continue to do that.

Senator GOLDWATER. We want to stay on top of this more than we have. If you would let us know, we would appreciate it.

Admiral McDONALD. We will try to keep you informed through your staff and you, individually, sir.

In the case of the F/A-18, the fiscal year 1983 budget request is $2.847 billion for 84 aircraft. That appears in that orange highlight, sir. Expressed in simple terms, the program unit cost of the F/A-18 has increased six-tenths of 1 percent over the past year and 2.8 percent from a development estimate of $22.2 million in constant fiscal year 1983 dollars to $22.8 million in constant fiscal year 1983 dollars.

Mr. Chairman, that, as I said, is a very simplistic expression of cost growth. Sharing your concern as well as that concern of the country and the people in general about the growth in defense spending, I feel a more in-depth explanation of the growth of the F/A-18 program is important.

To do that, we have to turn to the acquisition report itself. The congressional SAR documents program growth as changes. These bona fide changes are grouped in cost categories; namely, economic, schedule, engineering, estimating, quantity and support.

Of all the categories of change, only one works in favor of the manager, that is the cost decrease resulting from an increase in quantity of units to be procured.

As you know, the original procurement objective of the F/A-18 was 811 aircraft. This was later increased to 1,377. That program change took place in 1978. That increase, with the advantage of efficiencies and economies, has had a salutary effect on the unit cost of the F/A-18. You see the effect of that quantity change in the relatively low, 2.8 percent cost growth.

Now, one can make an adjustment of the cost growth associated with the change in quantity and, in fact, the Office of the Assistant Secretary of Defense, Comptroller, publishes a SAR program acquisition cost summary for the Congress which reports the percent of cost growth for the base year estimate adjustment for quantity changes.

Base year unit cost adjusted for quantity

	Percent
F/A-18	25
F-14	24
F-15	29
A-10	32
F-16	36

The latest report available to us is the one published on November 14, 1981, which shows the F/A-18 cost growth adjusted for quantity to be 25 percent.

If compared to other aircraft programs such as the F-14, you will see a 24-percent increase in that same report; the F-15, 29 percent; the A-10, 32 percent; and the F-16, 36 percent. The F/A-18 cost, when measured against that, although not exemplary, is certainly representative of current aircraft procurement programs.

However, when you and I refer to cost growth in the context of management of the program, we usually are referring to cost generated by changes to the estimating category; that is, the increased cost resulting from a program not being produced at the cost forecast by the managers.

To put it another way, it is that percentage of cost growth measured by actual performance compared to a perfect plan. Under those terms that 2.8 percent you see displayed on the slide has to be adjusted upward in the case of the F/A-18.

I will proceed then with the F-14 as the next aircraft, sir.

The F-14 is our all-weather fleet defense fighter airplane.

Senator GOLDWATER. Admiral, before you get to the 14, I think I am right in saying that Northrop's cost estimates have been consistently unreliable. Do you have any idea what that problem is?

Admiral MCDONALD. We are well aware, Senator, that Northrop has been coming in on their cost estimates above what the normal predicted production estimates would lead us to believe in comparision with other aircraft manufacturers.

McDonnell Douglas and Northrop have tried to solve this and have made serious efforts to get to the bottom of this. Most recently, McDonnell sent significant numbers of supervisors and online managers into the Northtop plant at Hawthorne.

There is an exchange taking place today of that type of expertise to again try to bring Northrop's production rates down to the line

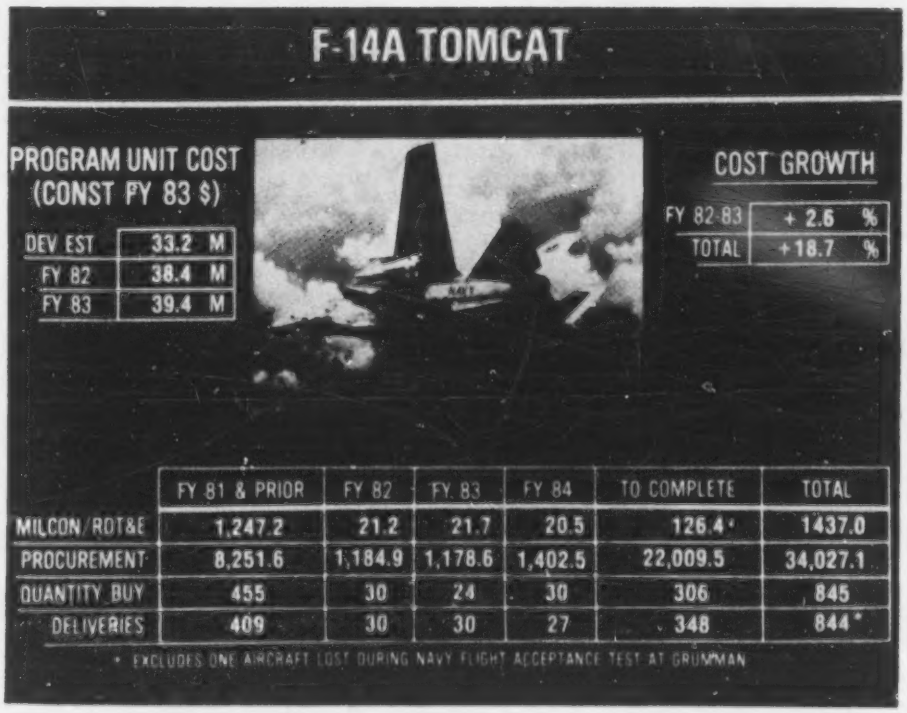
that we would expect as they are building the aft fuselage section. I think we are seeing that come down. It still is not where we would like to have it, however. I would like to ask Commodore Weaver to give you a further explanation on other initiatives we have to address that specific irritant in the cost problem with the F/A–18.

Commodore WEAVER. There are about 80 McDonnell Douglas aircraft personnel at the Northop facility assisting them in bringing their production problems into line. As Admiral McDonald indicated, the cost of the Northrop aft body is well above the industry average. We have numerous recovery programs. Right now we see them back on their contract delivery schedule. They are reducing the overtime on the production line.

We are gratified with the performance we are seeing over the past few months. In addition, we will soon receive from the prime contractor to Macair a proposal that will include the Northrop aft body contract cost. We will appraise your staff of this proposal as you requested. We hope to see reflected in that proposal those cost reductions as indicated by the efforts on the production line.

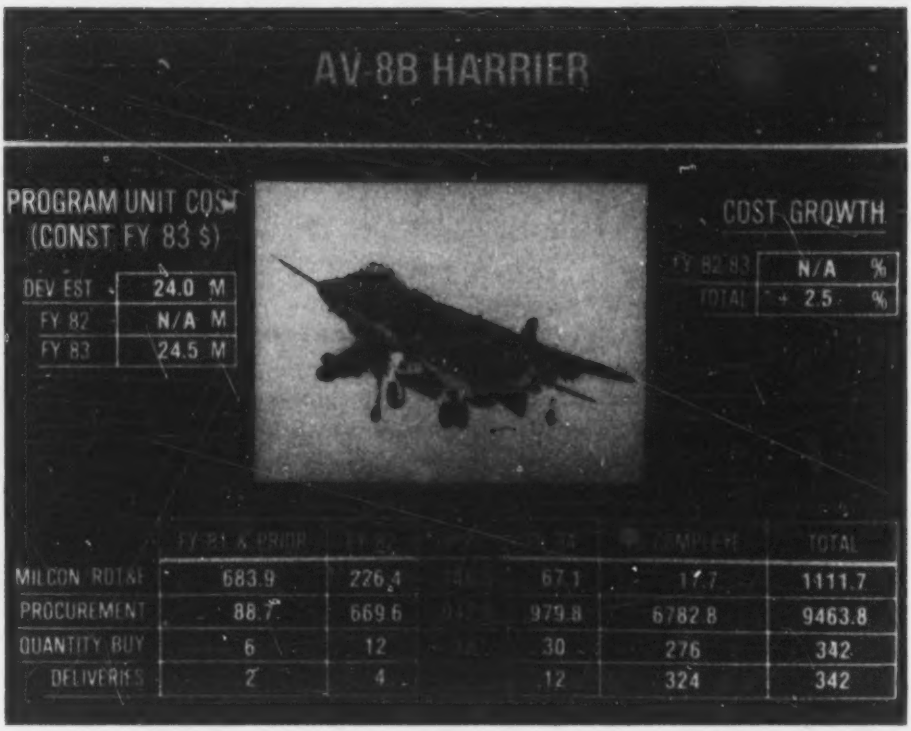
Senator GOLDWATER. I remember sitting with Mr. Jones one day. We were talking about this airplane. He said. "We are going to build that; it will never cost over $6.5 million." I would like to throw it at him once in a while. You may proceed.

Admiral MCDONALD. I wish it were a $6.5 million cost, Mr. Chairman.


F-14A TOMCAT
PROGRAM UNIT COST
(CONST FY 83 $)
DEV EST 33.2 M
FY 82 38.4 M
FY 83 39.4 M
COST GROWTH
FY 82-83 + 2.6 %
TOTAL +18.7 %
FY 81 & PRIOR | FY 82 | FY 83 | FY 84 | TO COMPLETE | TOTAL
MILCON/RDT&E | 1,247.2 | 21.2 | 21.7 | 20.5 | 126.4* | 1437.0
PROCUREMENT | 8,251.6 | 1,184.9 | 1,178.6 | 1,402.5 | 22,009.5 | 34,027.1
QUANTITY BUY | 455 | 30 | 24 | 30 | 306 | 845
DELIVERIES | 409 | 30 | 30 | 27 | 348 | 844*
* EXCLUDES ONE AIRCRAFT LOST DURING NAVY FLIGHT ACCEPTANCE TEST AT GRUMMAN

As I was discussing, the Tomcat is our all-weather fleet defense fighter. The fiscal year 1983 procurement request is for $1,178.6 bil-

lion for 24 aircraft. The program unit cost has increased 2.6 percent from fiscal year 1982 to fiscal year 1983 in constant 1983 dollars. The program unit cost has increased 18.7 percent from a development estimate of $33.2 million to $39.4 million. The flyaway unit cost on the aircraft is $38 million.



The AV-8B Harrier, which General White has spoken of, is our improved vector thrust V/STOL aircraft, which evolved from the AV-8A. The program unit cost has increased 2.1 percent from a development estimate of $24 million to $24.5 million. The flyaway unit cost is $28.3 million in this buy.

Senator GOLDWATER. That has gone up to $24.5 million?

Admiral MCDONALD. Yes, sir. The program unit cost has increased to $24.5 million in constant fiscal year 1983 dollars. That was a 2.5-percent increase from what it initially started out, at $24 million.

Senator GOLDWATER. I recall our first five AV-8's were under $10 million; is that right?

General WHITE. That is basically correct, Mr. Chairman, they were bought, as I recall, in 1971, for delivery in 1973.

Senator GOLDWATER. Admiral, as a Navy man, would the Navy be interested in this bird for smaller carriers?

Admiral MCDONALD. We are looking, Mr. Chairman, into the use of the AV-8B working off smaller carriers. We are using AV-8's on the LHA's. We have been using them on the LPH's. We are looking to the future with the JVX and V/STOL technology, JVX is coming along or at least the joint program is proceeding for it, and with the $10 million which the Congress put into the budget in

1982 we are proceeding with tilt-fan development. We are not looking to the AV-8B as a replacement in the V/STOL area. We intend to integrate the Marine Corps aboard Navy ships and as a normal evolution toward expanding to use V/STOL aircraft at sea. However, to use AV-8B or the B-plus, as it is sometimes referred, in a fighter configuration, is not a requirement at the present time for the Navy.

Senator GOLDWATER. How is Grumman coming along with that V/STOL of theirs?

Admiral MCDONALD. Grumman has a three-quarter model which I think they call the 698, which is a tilt fan. I will defer further comment on this and ask Admiral Seymour to comment on that.

Admiral SEYMOUR. The Grumman tilt aircraft is a ground-only model; it is not flight rated; it has been through one tunnel testing at Ames. It looks very attractive.

The Congress added $10 million last year for work on tilt fan. We have not yet turned on Grumman to pursue a flight-rated model of this aircraft.

The Naval Air Systems Command will be recommending that we compete a lift-fan kind of technology for demonstrator in conjunction with NASA. The beginnings of that program are not yet firm, so they are not under Government funding to pursue. However, Grumman is, as I can inform you, pursuing it on their own with their independent research and development money. They are making plans to go ahead and build a flight model; however, they probably will not actually build until we have it under contract.

Senator GOLDWATER. General White, have your people looked at this tilt rotor of Bell?

Mr. PAISLEY. Let me say something on that, if I might, Mr. Chairman. Earlier we made reference to a joint program between the Army, the Air Force, and the Navy, that we are presently structuring and we are not far from getting an agreement between the three services. It is a concept of trying to meet our requirements in the V/STOL area for a certain range of requirement, one of which is the Marines' requirement for the HXM. We propose to use the tilt rotor technology which has been developed by NASA and Bell. Currently there are two tilt-rotor aircraft flying, and we will have to scale up those vehicles to meet the HXM requirement. So, it looks very attractive from the viewpoint of satisfying a V/STOL requirement that might be put in a category of low to medium range while the tilt fan is medium to high range in terms of speed.

There is an overlap in the two. The technology from a timeframe is quite a bit different. The Bell aircraft is flying. I might say I flew it; in fact, I think most of the gentlemen here flew it. I found it very easy to fly and I am not a helicopter pilot, so you can transition into it very easily.

The technology as we see it is well in hand. I don't see any serious problems that are identified at this time.

I want to emphasize the timeframe of this technology is more near term than the technology we talked about that Grumman is developing.

Senator GOLDWATER. I have flown it, too. The question pops up in my mind, if we are thinking of it for tactical use, is its size. It

makes a large target sitting up there, but it is a remarkable aircraft, very easy to fly. I am thinking more of logistics use for the Marines than attack.

Mr. PAISLEY. That is correct. In fact, the general might say something on that.

General WHITE. Mr. Chairman, I, too, have flown the Bell tiltrotor and I am impressed with it. I am both a fixed-wing pilot and a helicopter pilot. I was amazed at its agility and easily flew the aircraft. I flew it for 45 minutes. I had the chief test pilot sitting next to me, but that is to be expected. It transitioned into the forward flight approaching 300 knots and transitioned back into the hover again, all very easily coordinated with the controls.

We see this aircraft as having the potential to fulfill that HXM Marine transport requirement I was talking about earlier.

You mentioned the vulnerability. Yes, any aircraft at subsonic speed is going to have a certain degree of vulnerability but certainly less vulnerability than a helicopter that is going at 120 at 130 knots.

Senator GOLDWATER. I am a helicopter pilot, too. I was really pleased with it. I hope you keep at it.

Mr. PAISLEY. Let me say one thing about the matter of keeping at it. I have not been in the Government very long, but there are two or three programs that I have tried to work hard on getting them to move faster and trying to get them out of R. & D. and onto the table so that we can get some of this capability in the fleet. I think we are moving in a very positive fashion on this program.

The thing that really makes me feel good is that we have been able to bring the three services together on this program. Our present agreement is that it will be an Army-run program and there will be a Marine Corps officer as a program manager, which is a nice arrangement.

Senator GOLDWATER. Fine.

One more question about the AV-8. Is the AV-8 more expensive than the F/A-18?

Admiral MCDONALD. The two are very close, Mr. Chairman. I will have to check the figures, but I think the AV-8B is slightly more expensive, but there are only 18 aircraft programed and there are 84 F/A-18's. There is an economy of scale. It is difficult to get into a comparison as to what the total program is going to be.

Senator GOLDWATER. Proceed.

A-6E INTRUDER

FY 83 PROCUREMENT REQUEST

$ 276.6 M

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	54.3	–	4.7	3.0	13.9	75.9
PROCUREMENT	1,778.6	295.0	276.6	311.2	1,141.0	3802.4
QUANTITY BUY	141	12	8	8	36	205
DELIVERIES	123	6	10	14	52	205

Admiral McDONALD. The A-6 Intruder, which is an all-weather, medium attack aircraft, the fiscal year 1983 procurement request is for $276.6 million for eight aircraft. Procurement unit cost is $34.6 million compared to $24.6 million in fiscal year 1982.

Senator WARNER. Go over those figures again.

Admiral McDONALD. The procurement is $276.6 million.

Senator WARNER. How does that compare with your attrition rate in the last fiscal year?

Admiral McDONALD. In the A-6, eight will suffice in 1983, Senator Warner. We have not had especially heavy attrition in the A-6. We had it in the EA-6B last year, which, of course, is a derivative of that airplane. The year before, as you well remember, we had a terrible year with six A-6E accidents. In 1981 that accident rate turned around. A procurement of eight will continue to provide enough aircraft to reach the 13 carrier air wing on time.

Senator WARNER. It barely keeps that line going?

Admiral McDONALD. That is correct.

Senator GOLDWATER. When did you fly this? When did the Navy first get it?

Admiral McDONALD. The air flight was in the early- to mid-1960's. I was in combat in 1965 and had one of the first deployed A-6 squadrons in my air wing; I would say the first deployment was in the fleet 1962-63 timeframe.

Senator GOLDWATER. That is about the oldest aircraft we have flying.

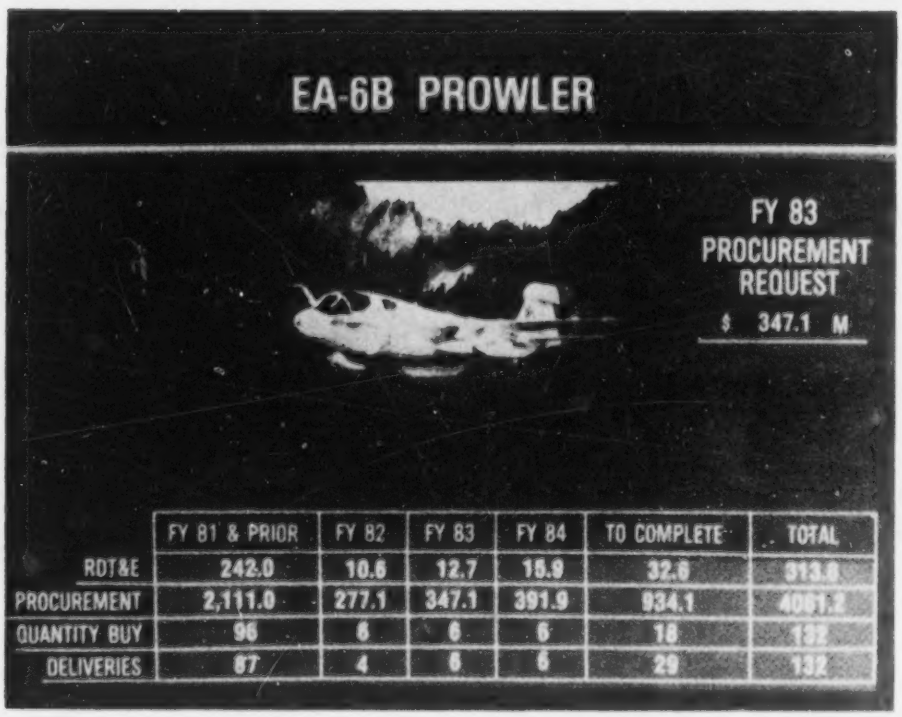
Admiral McDONALD. It is not the most aesthetic looking either, but it is still doing its job.

Senator GOLDWATER. Your cost is a little confusing. On the left is that $34.6 million for eight aircraft now?

Admiral MCDONALD. Yes, sir, that is the 1983 procurement unit cost for it in 1983. You can see what has happened. In 1982 and 1983 there was a $10 million delta. The explanation for that $10 million delta is in the small type underneath it, where you have $2.4 million, which is strictly from escalation, $3.4 million came in support for that 13th carrier air wing, PCSE and for TRAM equipment in the airplane: $2.3 million resulted from the quantity adjustment where we went from 12 to 8, and then $1 million was a startup for planning for the multiyear procurement which we were looking to possibly see if we could afford the multiyear procurement. If we could procure this airplane 1984 through 1987 on a multiyear procurement basis, we estimate we could save $25.6 million. We do not plan to multiyear procure this year, however.

Senator WARNER. What is the total inventory you have today on this aircraft?

Admiral SEYMOUR. 330, sir, at the end of the 1982 fiscal year.



	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	242.0	10.6	12.7	15.9	32.6	313.8
PROCUREMENT	2,111.0	277.1	347.1	391.9	934.1	4061.2
QUANTITY BUY	96	6	6	6	18	132
DELIVERIES	87	4	6	6	29	132

Admiral MCDONALD. The EA-6B Prowler provides electronic countermeasures, defense suppression, tactical jamming. Fiscal year 1983 procurement request is $347.1 million for six aircraft. Procurement unit cost is $57.8 million. Flyaway cost is $34.5 million.

CH-53E SUPER STALLION

FY 83 PROCUREMENT REQUEST

$ 311.0 M

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
MILCON/RDT&E	182.1	10.9	12.0	7.9	.5	213.4
PROCUREMENT	742.6	260.8	311.0	367.2	2,500.6	4182.2
QUANTITY BUY	51	14	11	11	77	164
DELIVERIES	14	18	14	15	103	164

CH-53E, Superstallion, which General White referred to earlier in his testimony, is a heavy transport helicopter. Fiscal year 1983 procurement request in $311 million for 11 aircraft. The procurement unit cost is $28.3 million, compared to $18.6 million in fiscal year 1982. Flyaway unit cost is $19.6 million. Again, you see the difference there.

Senator GOLDWATER. $28 million cost this year?

Admiral MCDONALD. That is for 11 aircraft, sir.

Senator GOLDWATER. I am upset about the AH-64 request for 16.

Admiral MCDONALD. You may be talking different dollars. That is different dollars. That is procurement unit cost. The flyaway cost for the CH-53 is $19.6 million. That may be closer to the comparison you have on the AH-64.

AH-1T SEA COBRA

FY 83 PROCUREMENT REQUEST

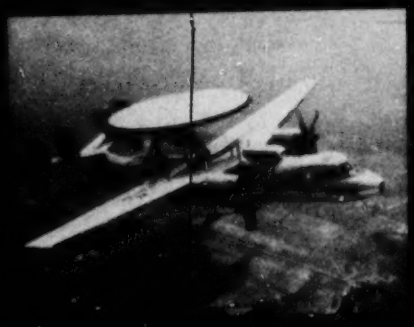
$ 17.2 M

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	–	–	–	–	–	–
PROCUREMENT	285.1	–	17.2	196.3	178.5	676.1
QUANTITY BUY	124	–	–	22	22	168
DELIVERIES	124*	–	–	–	44	168*

* INCLUDES 87 AH-1J MODELS NOT CONVERTED TO AH-1T

The AH–1T Sea Cobra, this request is for $17.2 million for advance procurement for 22 aircraft, which we hope to buy in 1984 in the budget we submit at that time.

E-2C HAWKEYE



FY 83 PROCUREMENT REQUEST

$ 352.7 M

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
MILCON/RDT&E	243.8	18.9	52.3	47.0	84.6	446.6
PROCUREMENT	1,952.2	266.2	352.7	315.9	1,034.4	3921.4
QUANTITY BUY	73	6	6	6	18	109
DELIVERIES	62	6	6	6	27	107*

* EXCLUDES 2 F2A PROTOTYPES

The E-2C Hawkeye, which is our all-weather early warning strike and traffic control aircraft, the fiscal year 1983 procurement request is $352.7 million for six aircraft.

Senator GOLDWATER. That has been a good airplane?

Admiral MCDONALD. Yes, sir; it has been a superb airplane. We have been using it in a lot of things we did not anticipate using it in. It has been used in Florida trying to intercept some of the drug smuggling that is taking place.

Senator GOLDWATER. What engine do you want to substitute?

Admiral MCDONALD. I think we are upgrading the engine. It has a T-56 engine in it. We are going to be using T-56's in the C-2 and E-2. That will be a common engine.

Admiral Seymour, do you have any comment on that?

Senator GOLDWATER. What is the shaft horsepower?

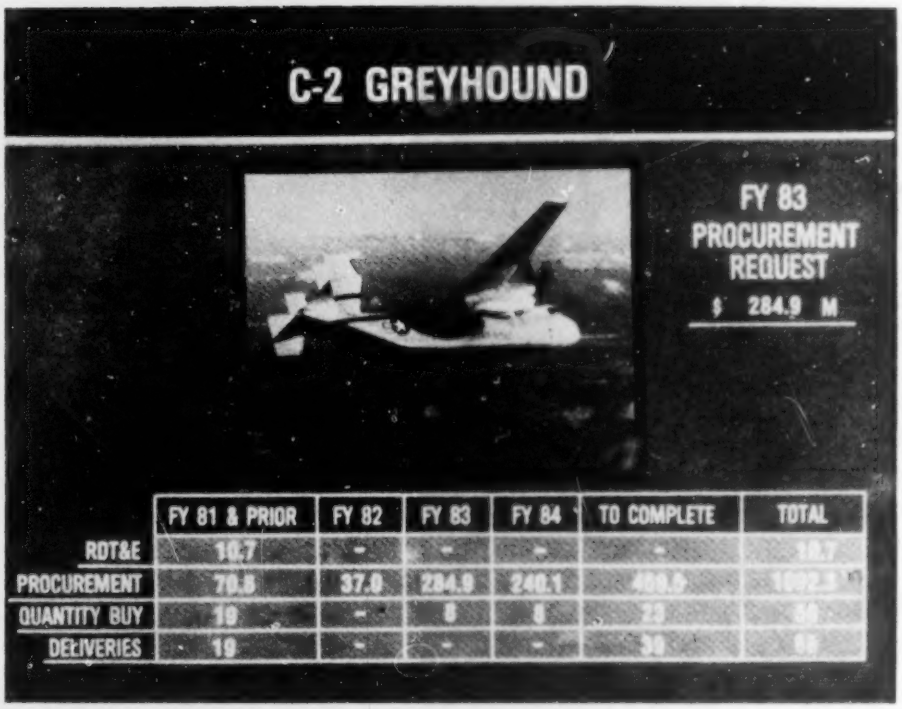
Admiral SEYMOUR. 4,500.

Senator GOLDWATER. What do you want to go to? Will the new engine upgrade the shaft power?

Admiral SEYMOUR. Excuse me, it is 4,050 now. We are upgrading to 4,600.

Senator GOLDWATER. Who makes that engine?

Admiral SEYMOUR. Allison built the engine.



Admiral McDONALD. The C–2 Greyhound, which is a transport configuration of the E–2C; $248.9 million for eight aircraft. Procurement unit cost is $35.6 million.

This is the first year, Mr. Chairman, of a multiyear procurement for the C–2's since we signed the contract with Grumman to build 39 of them through a 5-year procurement of 8 during the first 4 years and 7 the last year. This should provide us with the carrier-on-board delivery ranges that we perceive we will need in the foreseeable future.

Senator GOLDWATER. What would be the range of this?

Admiral McDONALD. It depends on the load, but we feel comfortable with 1,200 miles with this COD. It may go further than that. With the full load to deliver, it can honestly handle 1,200 miles without any problem.

Senator GOLDWATER. You allocate so many to a carrier, or does it become a joint force?

Admiral McDONALD. It becomes a joint force, sir. We will try to position those in strategic areas. We currently have them operating out of the Philippines and then forward basing wherever they need to be. We have them in Rota and in Sigonella to cover the Mediterranean. When our ships operate at extended ranges, depending on where we will be operating we look to use forward basings to provide that.

Senator WARNER. What is your airframe? Is this off the shelf?

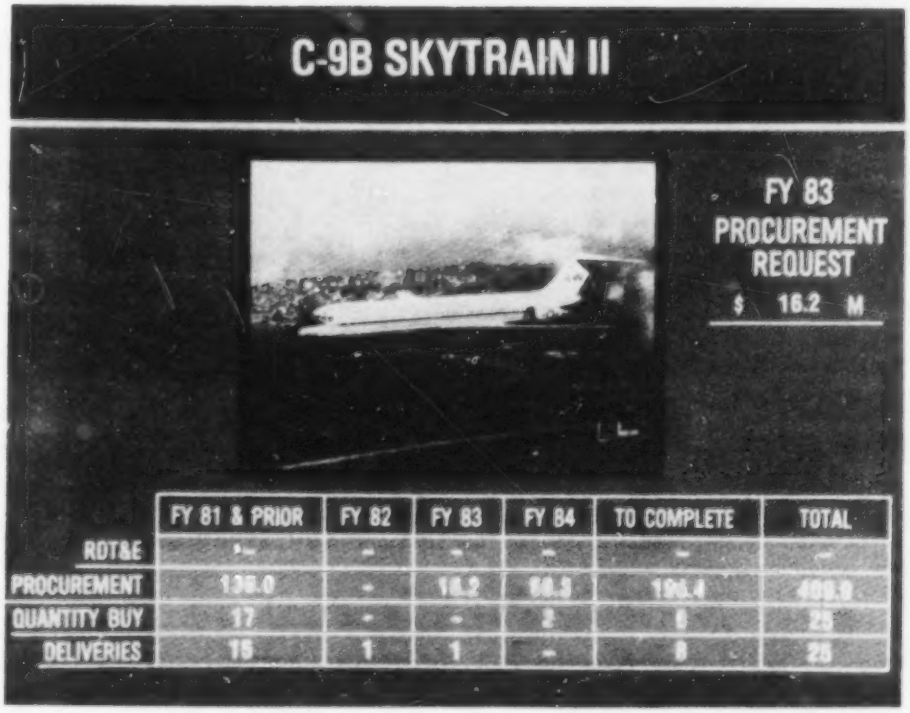
Admiral McDONALD. This is the C–2 again, just a modified version of it.

Senator WARNER. Modified version of what?

Admiral McDONALD. The C-2 Greyhound, which is an airplane about 15 years old. We reopened the line and did some ECPs, engineering change proposals, to upgrade it. We have done composite work on the airframe, put some new navigation gear in it.

Senator WARNER. What is the engine?

Admiral McDONALD. The T-56 is the engine in the airplane, the same one as in the E-2C.



	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	-	-	-	-	-	-
PROCUREMENT	136.0	-	16.2	68.3	196.4	416.9
QUANTITY BUY	17	-	-	2	6	25
DELIVERIES	15	1	1	-	8	25

C-9 Skytrain II, which, of course, is our organic lift aircraft—fiscal year 1983 procurement request is for $16.2 million for procurement of used aircraft. We are at the present time seeing what we can do to buy used aircraft; if not buy then to lease aircraft with the option to buy later on. This is a subject that will be a matter that the Secretary will be discussing with the chairman of the committee.

Senator GOLDWATER. Let me ask you—I know the Air Force is interested—I wonder if you are interested in that new Gulfstream III? It can be bought around this cost, a little less, I believe, and I think it can be configured for about 20 seats. It will cruise very comfortably at 48,000 to 50,000 feet. It really is a remarkable airplane. I just wondered if you had thought of maybe modernizing the 9's with that new Gulfstream?

Admiral McDONALD. Senator, the C-9, for us, is carrying larger capacities than the Gulfstream and we are using it also as a cargo carrier for us. We need something that gives us seating in the capacity of 75 to 100, maybe 100 plus, when we are moving personnel of carrier wings from Norfolk down to Jacksonville, Fla. for example or from Lemoore to San Diego.

This airplane really earns its way. The Gulfstream has all the attributes but it will not provide the support of heavy lift we need in this particular field.

Senator GOLDWATER. The Air Force is thinking of it as an upgraded 140 that can make transocean flights. In fact, one of them came from Tokyo to Los Angeles nonstop. Well, that is not your problem.

Admiral MCDONALD. We have a hard time justifying that, Senator. As much as I would like to have it in the inventory, I don't think I could justify it on that type of haul. We are looking to trying to solve the logistics with the C-9. We are looking to using used aircraft. To buy C-9s we are getting estimates on those aircraft that are similar to the ones we have in the inventory now at about $20 to $25 million a copy.

Senator GOLDWATER. What?

Admiral MCDONALD. If we were to replenish it with new aircraft, we would be looking at something in the range of $20 to $25 million a copy for one C-9 new; that is why we are looking at used C-9s. There is every indication that the airlines market is available out there to tap for some good aircraft.

Senator WARNER. In terms of the quantity this year, you just want to put the money in the bank to get them?

Admiral MCDONALD. We hope to buy some used aircraft; if not buy, to lease some aircraft, with the option to buy.

Senator WARNER. Why do you have a blank there?

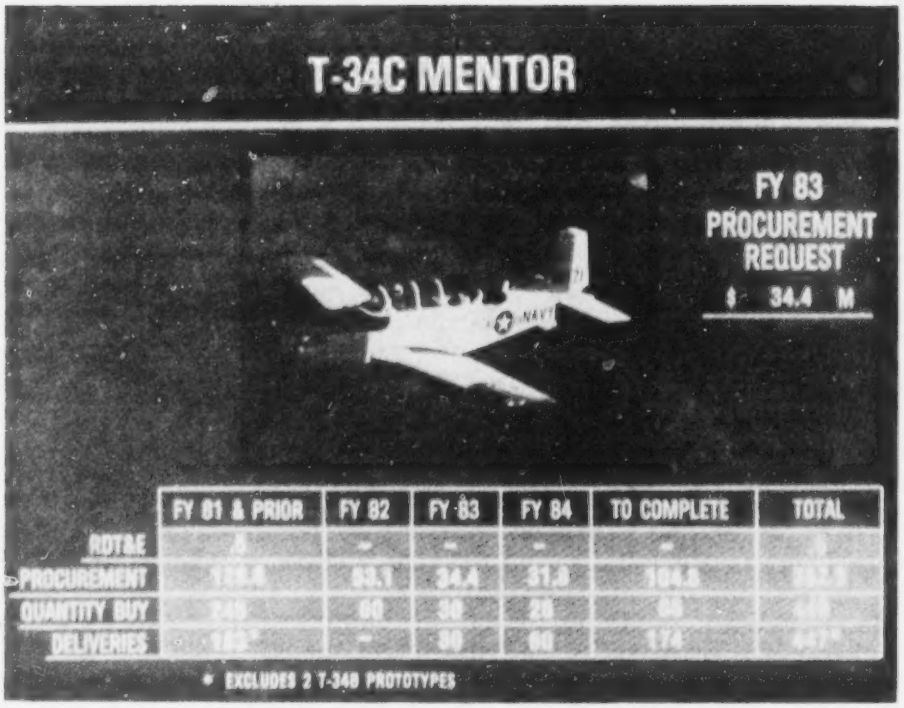
Admiral MCDONALD. Because we have not defined what that number is, sir. If we could get four for $16 million, I would like to do that. I don't think that will happen.

Senator WARNER. Maybe what you need is a question mark instead of a blank?

Admiral MCDONALD. Yes, sir.

Senator WARNER. It is the Air Force which asked to do this type of logistic support; with a requirement for the Navy to have its own integral force.

Admiral MCDONALD. I think that has been resolved to the point where the Navy has the requirement in many cases that overtaxes MAC's capability to provide that lift in a timely manner. We certainly are not competing with MAC. We are just trying to meet those hard requirements that sometimes MAC is unable to provide.



Shifting to training command aircraft, the T-34C Mentor is our primary flight trainer; it is a turbo-prop airplane.

The procurement request is $34.4 million for 30 aircraft. When you look at all the other dollars you have been looking at, that is a real bargain.

Senator GOLDWATER. Would you like to go to a jet engine instead of a prop trainer?

Admiral MCDONALD. Not the way our training command is structured sir. We start everybody in the T-34C. There is a decision made as they approach the end of that training phase which splits people off into helicopters, maritime patrol, which is, again, a turbo-prop engine, or into jet trainers.

So, we think that the basic or primary training command gives a good foundation. It is about 65 hours of initial flight training for an individual. The student simply learns to fly.

Senator GOLDWATER. What is your first jet trainer?

Admiral MCDONALD. In the training command now it is the T-2C. Intermediate training is in the 2-C built by Rockwell International, which is no longer in production. They matriculate from intermediate to the advanced training phase in the TA-4J Skyhawk.

Senator GOLDWATER. Did you look at the small British trainer and the French trainer?

Admiral MCDONALD. We have completed the VTXTS source selection for the undergraduate jet flight training system in November and made the decision to select the Hawk from six competing proposals that had been submitted. All had been examined very carefully over a period of 6 months prior to selection.

The Hawk is proposed at the current time as a replacement for the T-2 and the TA-4, so it would take the place of those two aircraft and give us commonalty in our training. We would then save time in the training command and have just one aircraft after the T-34 for jet students.

Senator GOLDWATER. The company that is building the Gulfstream had a trainer. Have you looked at that?

Admiral SEYMOUR. That is Grumman.

Admiral MCDONALD. Yes, sir. I think it is Gulfstream American. I do not think they have a jet trainer, since they did not bid on the proposal. The people who submitted bids for the VTXTS, Senator, were Grumman and, of course, British Aerospace with Douglas on the Hawk, and Douglas with the new aircraft, Lockheed and a consortium of Dassault Durea and Daruies. Northrop with a new design, and Rockwell with a modified T-2C.

We are looking for off-the-shelf replacements for the Marine Corps in their lift problems.

Senator GOLDWATER. I did not get to fly the Hawk, but I did get to fly the Alpha jet. I was very, very impressed with it. My assistant flew the Hawk. I think he likes it better than the Alpha jet.

Mr. PAISELY. The secretary flew both of the jets. I talked to him about that. He thought that the Hawk was the easier of the two. He was impressed by both of them. In fact, he got off the Alpha jet in an inverted spin, had a lot of fun with it. He found that the Hawk was an easier airplane to fly, a very forgiving airplane. He was impressed by both of them, too. Both are good, off-the-shelf airplanes and the Hawk was clearly picked as the winner out of the competition.

I was glad to see we were able to meet our requirements with an existing airplane. If you can't meet it in the training command, I don't know where you will meet it. The only thing we are going to have to do is some of the things the Admiral mentioned in terms of making it capable for a carrier.

Senator GOLDWATER. I think they both have fine characteristics. The T-38 is probably a little better and much easier airplane to fly. I was just asking questions.

Admiral MCDONALD. The procurement unit cost——

Senator GOLDWATER. Just a moment. The VTX program is for all practical purposes not funded in FYDP, the 5 year defense plan. A conservative estimate is that projected funding falls short by about $1.5 billion.

Is the Navy still committed to funding the VTX?

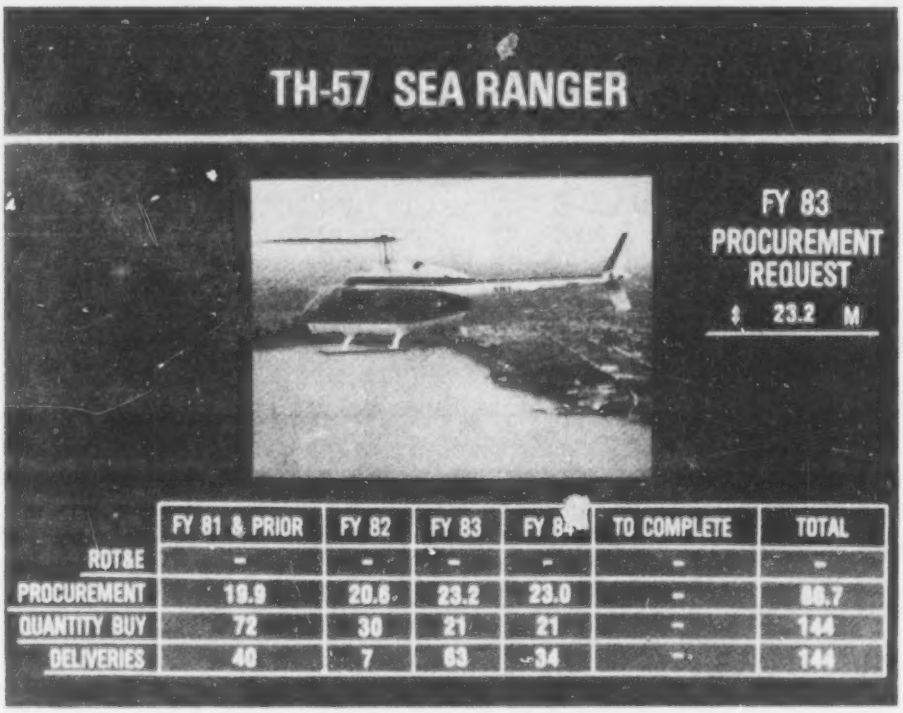
Admiral MCDONALD. We have looked at alternative funding for the VTX. We have affordability problems, Mr. Chairman. The FYDP that you see, the 5 year defense plan with restructuring will, in fact, accommodate continuation of the Hawk initially in the dry mode, and then in a wet mode.

Again, we are looking at this very carefully to see how we can structure that program to make it fit.

Senator GOLDWATER. We are talking about off the shelf. Are you going to require substantial modifications to the Hawk before you get it into service?

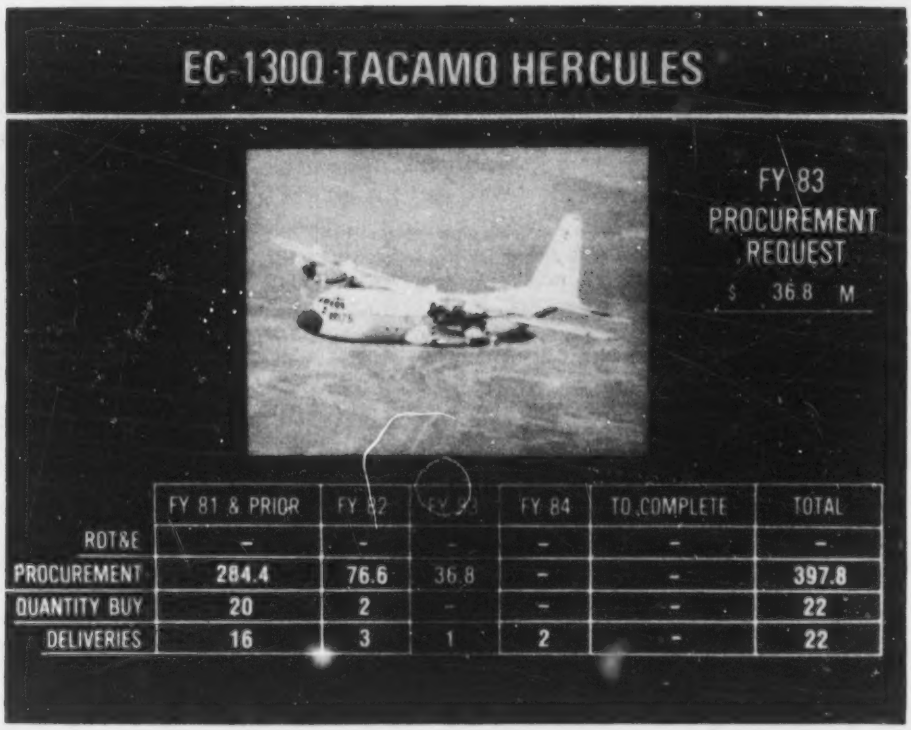
Admiral MCDONALD. We don't see substantial modifications being necessary to do what we call dry training, which will use a

noncarrier version the Hawk; however, to put the Hawk into the carrier we are going to have to do such things as strengthen the keel, beef the gear up to allow for the carrier practice landings that require a sink rate of about 18 feet per second. We will have to do other types of nose wheel modifications so that it can be catapulted, things like that, change the speed brake position so that they are not underneath but open on the side of the aircraft. These are minimum modifications to keep the Hawk as close to off the shelf as we can.



	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	-	-	-	-	-	-
PROCUREMENT	19.9	20.6	23.2	23.0	-	86.7
QUANTITY BUY	72	30	21	21	-	144
DELIVERIES	40	7	63	34	-	144

The TH-57 Sea Ranger is our helicopter flight trainer. The fiscal year 1983 procurement is $23.2 million for 21 airplanes. Procurement unit cost is $1.1 million, compared to the $700,000 in fiscal year 1982. Flyaway cost for the airplane is $566,000.



	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	-	-	-	-	-	-
PROCUREMENT	284.4	76.6	36.8	-	-	397.8
QUANTITY BUY	20	2	-	-	-	22
DELIVERIES	16	3	1	2	-	22

The C-130 Hercules is our communications link with our submarines. The fiscal year 1983 procurement request is $36.8 million, for communications equipment only. We are not buying the aircraft. We are buying new communications equipment to put in the aircraft shell.

ECX is our replacement aircraft for fleet ballistic submarines, will replace the EC-130 in the Tacamo role. You don't see any pictures here because it is in competition right now. We don't know what that airplane is going to be. We have asked for requests for proposals. The budget includes $41.6 million for development of the aircraft.

Senator GOLDWATER. When will that come on board?

Admiral SEYMOUR. 1986.

Admiral MCDONALD. If we start production, the R. & D. at this time and continue with it, the first significant APN costs go in in 1984 and then build up to a significant amount in 1985, and then the first delivery in 1986.

Senator GOLDWATER. Will this aircraft be used for major communications with submarines?

Admiral MCDONALD. I can't respond to that.

Mr. PAISLEY. It is not a laser communication, if that is what I understood you to ask.

Senator GOLDWATER. Thank you.

Admiral MCDONALD. That sums up the aircraft systems for the TACAIR hearing, Mr. Chairman.

I have some weapons procurement programs that are unique aerial weapon systems. With your permission, we will run through those quickly and then open it to any questions you may have.

AIM-9M SIDEWINDER

PROGRAM UNIT COST (CONST FY 83 $)

DEV EST	.084 M
FY 82	.168 M
FY 83	.073 M

COST GROWTH

FY 82-83	-54.4 %
TOTAL	-13.1 %

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
MILCON/RDT&E	30.8	-	-	-	-	30.8
PROCUREMENT	44.2	51.9	43.1	34.7	249.9	423.8
QUANTITY BUY	289	700	500	450	3388	5327

AIM-9 Sidewinder is a short-range air-to-air missile. The fiscal year 1983 request is $43.1 million for 500 missiles. The program unit cost has decreased 54.4 percent from fiscal year 1982 to fiscal year 1983 in constant fiscal year 1983 dollars. The program unit cost has decreased 13.1 percent from a development estimate of 84,000 to 73,000 in constant fiscal year 1983 dollars.

Senator WARNER. General White, it appears that the Marine Corps is going to be able to procure the AV-8B. Are you satisfied with the procurement rate?

General WHITE. Senator Warner, you are referring to the 18 aircraft in this year's budget?

Senator WARNER. Yes.

General WHITE. The direct answer to that, Senator Warner, is no, I am not. We have just discussed the price of the AV-8B. One of the contributors, one of the main contributing factors, to the increased price of the AV-8B is the small unit buy. If we could increase it to the original program of 24, the price would come down substantially.

There are other factors that we are concerned with, such as the modernization of light attack force now flying A-4M aircraft. Well, during the period that we hope to transition to the AV-8B we will experience a shortfall in those A-4M squadrons. We had hoped to take care of the shortfall with the introduction of the AV-8B. With the slowdown we will have some difficulty there. Of course, there is a direct effect on our Reserve component which will not get the A-4M's in the scheduled fashion.

The main concern is one of pricing. We have hopefully given the perception of being very frugal with the AV-8B program through-

out the years because we appreciate the difficulty that everybody was having in providing the Marine Corps with this very unique aircraft. So, my main concern rests on the small buy and its relationship to the cost increase.

Senator WARNER. Why is the Marine Corps purchasing the AH-1T Cobra while the Army is getting the AH-64?

General WHITE. Mr. Warner, we have looked at the AH-64—it is now called the Apache—and are very much impressed with the aircraft. We have been following that program very closely. We have had Marine pilots fly it. Admiral Seymour's technicians have taken a look at it; but we also have at the present time an ongoing purchase of some 44 AH-1T Cobras. We would like to complete that buy. We would like to see the outcome of the Army's development program and the costing difficulty that the Army has experienced, and see what the outcome is before we make a final decision.

Senator GOLDWATER. General White, with the very favorable report coming in on the F/A-18, there are some who believe the F/A-18 will one day replace the A-6E in the Marine inventory. What is your opinion of that idea?

General WHITE. That is a possibility, Mr. Chairman. I think it is way too early to make any prediction about the demise of the A-6E. The A-6E is a very capable aircraft. It is true, we are buying it in small quantities. It is true that our inventory is low—10 aircraft per squadron—nevertheless from a standpoint of heavy haul of ordnance and ability to attack targets at night in all weather conditions, that tells me we should hang on to the A-6E as long as we possibly can.

As for replacement, the F/A-18 with new systems would certainly be a candidate aircraft, but it should not be the only candidate as a potential replacement for the A-6E.

Senator GOLDWATER. What would be the disadvantages of that decision?

General WHITE. Mr. Chairman, I am not sure I understand your question.

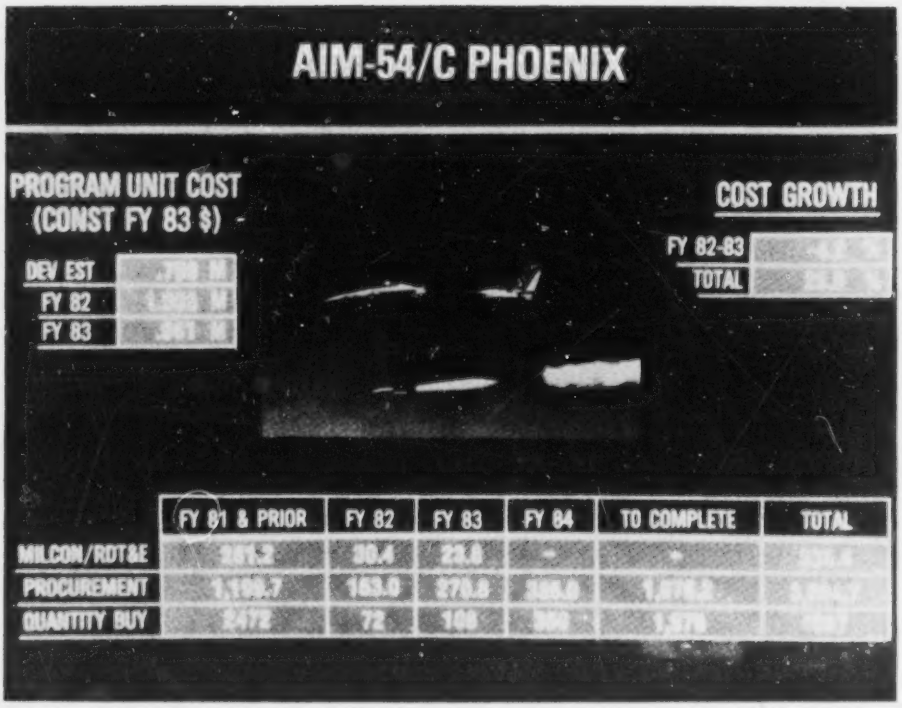
Senator GOLDWATER. If you dropped the A-6E and took the F/A-18, do you feel there would be benefits? Can you see any disadvantages?

General WHITE. The F/A-18 has some very remarkable equipment aboard—sensors, very excellent radar—but, nevertheless, in our opinion, the F/A-18 at this stage of its development cannot do the complete job that the A-6E can do from the standpoint of night and all-weather conditions.

Admiral MCDONALD. I think General White sums it up in his last phrasing there—night and all-weather capabilities, the fact that the F/A-18 is a single-pilot airplane. With the A-6 you have a bombardier and navigator for additional input and capabilities on the airplane, plus the A-6 is going to carry significantly heavier bomb loads than the F/A-18, if you really want to load it up and do some specific type of night mission.

I concur with what he said. We obviously will be looking into the future at something for an A-6 replacement. We are looking into that kind of replacement in the midnineties, Mr. Chairman.

The AIM/RIM–7 Sparrow which is a medium-range, all-weather air-to-air missile and surface-to-air missile. The fiscal year 1983 procurement request is for $138.5 million for 670 missiles, of which 285 are for aviation use. The program unit cost has increased 24.4 percent from fiscal year 1982 to fiscal year 1983 in constant fiscal year 1983 dollars. The program unit cost has increased 33.9 percent, from a development estimate of $118,000 to $158,000 in constant fiscal year 1983 dollars.



The AIM-54C Phoenix is a long-range fleet air defense missile which is only deployed with the F-14. The 1983 procurement request is $270.8 million for 108 missiles. The program unit cost has increased 25 percent from a development estimate of $769,000 to $961,000.

Senator GOLDWATER. Let us go back to the Sparrow. Would you elaborate on both the performance and cost problems experienced in the Sparrow program?

Admiral MCDONALD. I will let Admiral Monroe talk to the performance of it and some of the things we have seen on the Sparrow recently, sir.

Admiral MONROE. Mr. Chairman, the AIM-7M monopulse missile went into operational evaluation last summer, a joint program by both the Navy and Air Force. We had two kinds of problems in the firing program, the actual launches against very difficult targets. A few problems occurred, not in any one particular pattern but rather several isolated problems in the reliability area, which is tested by means of a captive carry program over a lot of flight hours.

The mean flight hours between failures was far lower than it should have been. Last summer, in August, we suspended the Opeval and commenced a major quality control effort in the Raytheon plant in Lowell. We have since held the production rate to a low level until the early missiles proved both good quality and reliable, and until the firing program shows consistently high success rates.

We anticipate being back into the Opeval this spring. We know the performance of the AIM-7M monopulse missile is far better

from the testing that has been done in the past than the AIM-7F predecessor, so we are quite confident we can clean up the last remaining difficulties which are quite normal in the air-to-air missile program. Its predecessor, AIM-7F, had them; AIM-9L had them. We are seeing the normal difficulties as you transition from R. & D. missiles to production missiles.

I have little doubt that it will prove to be both very effective and very reliable as we get these problems ironed out. It does mean that production rate will stay low until we do.

As far as the cost problems you asked about, I might pass this to Admiral Wilkinson, deputy commander of Naval Air Systems Command.

STATEMENT OF REAR ADM. JOSEPH B. WILKINSON, USN, DEPUTY COMMANDER, NAVAL AIR SYSTEMS COMMAND (PLANS AND PROGRAMS), OFFICE OF THE CHIEF OF NAVAL OPERATIONS, DEPARTMENT OF THE NAVY

Admiral WILKINSON. Actually, the reasons for the cost growth are primarily inflation being higher than we had anticipated, plus a stretch in the program of almost 1 year by the low production rates in fiscal year, 1982 and 1983. We are trying to reduce cost.

The primary thing we are trying to do is get competition. We have the second source in production now in 1982. We will try to compete this missile in fiscal year 1983. We hope to get the price lower.

Senator GOLDWATER. Thank you.

Admiral MCDONALD. We will go to the AIM-54C, which is our long-range fleet air defense missile and is only employed on the F-14. The procurement request is for $270.8 million for 108 missiles. The program unit cost has decreased 4.2 percent from 1982 to 1983 in constant fiscal year 1983 dollars. The program unit cost has increased 25 percent from a development estimate of $769,000 to $961,000 in constant 1983 dollars.

Senator GOLDWATER. How do you account for the increase in unit cost of the Phoenix?

Admiral MCDONALD. I am sorry, Senator.

Senator GOLDWATER. How do you explain the increase in the unit cost of the Phoenix?

Admiral MCDONALD. We have, of course, put in the AIM-54C some modifications, Senator, to upgrade that missile and its capabilities to go against the threat. We were initially concerned with the AIM-54A being compromised in the Iranian situation. Not only have we put in new modifications to offset that compromise but also the missile performs much better in an electronic countermeasure environment. I will defer again to Admiral Wilkinson on cost growth.

Admiral WILKINSON. One of the reasons why it looks a little bit higher in 1983 is that there is tooling in there to ramp up in fiscal year 1984. There is $35 million of tooling in the fiscal year 1983 number which counts against the unit price.

Phoenix is another missile that we have in concurrent production. We want to keep that rate low until we are assured that the missile is ready to go.

There has also been an increase in the inventory requirement of the Phoenix. Those additional missiles are in the outyears and they show higher in then-year dollar cost but in constant dollars they don't show much difference.

Mr. PAISLEY. I think we ought to give you an answer for the record on this, because, as I was listening to us I did not get the answer, myself. I don't think we have clearly explained to you that cost growth. We will give it to you in an official answer for the record.

Senator GOLDWATER. I wish you would, but I don't know if you really know it. Have the program managers discussed this with you themselves? They make this rascal down in my State. I thought the price was fairly stable on it, but it has jumped up—unless you have added a lot of sophistication to it that we don't know about.

Admiral MCDONALD. There has been a significant upgrade of that missile from the AIM-54A, which was the first missile that was built, to the AIM-54C, to make it perform better in the world we see it projecting into in the late 1980's and early 1990's.

That is our main standoff threat.

Senator GOLDWATER. Have you increased the range?

Admiral MCDONALD. The range has not been increased. It performs better primarily because of [deleted] that has been made to it.

Improvement in ECCM performance has also been added to it. I think there has been some repackaging done to the weapon; we have sealed it to improve the maintainability.

Admiral Wilkinson has discussed some of the major increases in it as far as tooling, but we will provide you with a more complete answer.

[The information follows:]

PHOENIX MISSILE

In constant fiscal year 1983 dollars, the total program unit cost for the Phoenix missile has increased from $769,000 to $961,000. The unit cost of $769,000 was the original estimate, made in the 1963 timeframe but now expressed in fiscal year 1983 dollars, to develop and procure 2,384 Phoenix A missiles. The $961,000 current estimate includes the procurement of 2,218 Phoenix A missiles up to fiscal year 1979 as well as the development and procurement costs of an additional 2,635 Phoenix C missiles being procured in the fiscal year 1980-1988 timeframe.

The Phoenix C program is a major revision to the A missile, introducing digital vice analog circuitry, expanded launch zones, improved clutter immunity, increased ECCM capability, and improved operational readiness and reliability. The digital features of this missile will also eliminate dependency on cooling fluid from the aircraft, a system that has presented significant aircraft maintenance problems.

Senator WARNER. On the Phoenix system, you say you have modified it so that it is not compromised by the Soviets? In other words, from the Iranian experience we have taken the missile and redesigned it?

Admiral MCDONALD. We have changed enough of the [deleted]. That is what we have tried to do.

Senator WARNER. Would some of the cost be attributed to that?

Admiral MCDONALD. Yes, sir. That, is also part of the increase.

Senator WARNER. What is your present inventory now?

Admiral MCDONALD. Currently there are [deleted] in inventory right now. The inventory at the end of fiscal year will be [deleted].

Those are Alpha missiles. If we are talking Charlie missiles, we have not received those. The first ones of those are just about to come right now, so we are really talking to the A missiles, the Alpha models, still in the fleet.

Senator WARNER. What is your training requirement each year?

Senator GOLDWATER. How much more time will you need?

Admiral MCDONALD. I think we can wrap it up in 10 minutes. I have only Harpoon and Harm to go through.

Senator GOLDWATER. I have to leave. I apologize. We are having lunch with the President.

Admiral MCDONALD. We don't have a fixed number but the average is someplace around [deleted].

Senator WARNER. Per annum?

Admiral MCDONALD. Yes, sir.

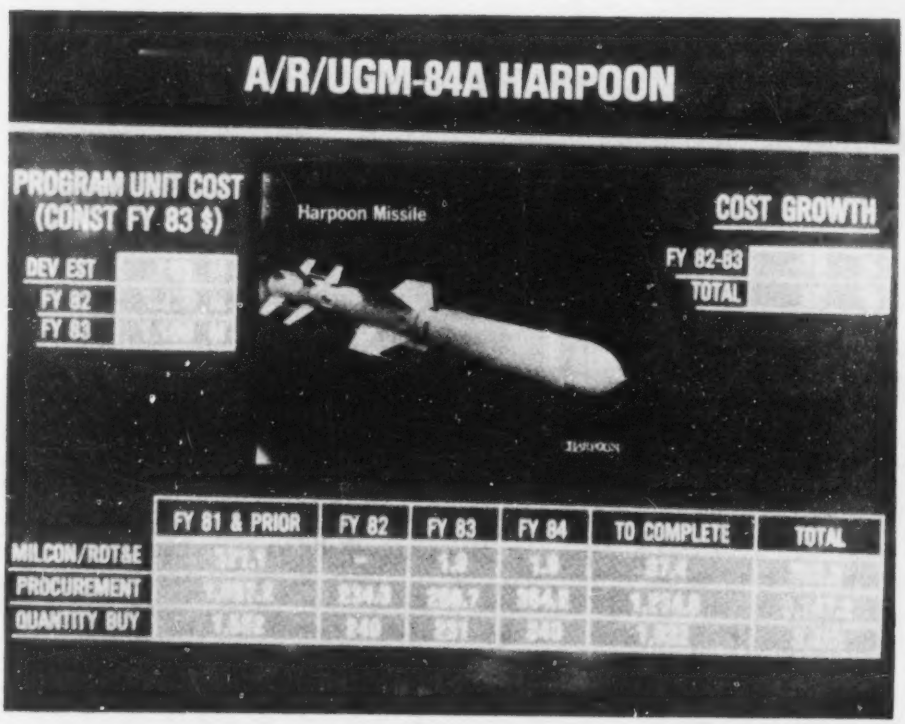
Senator WARNER. They are totally expended?

Admiral MCDONALD. Yes, sir, nonrecoverable; they are gone. That represents approximately [deleted] of the procurement objective.

Senator WARNER. On those training missions, what is your success rate?

Admiral MCDONALD. [Deleted] percent is the success rate we have seen with the Phoenix, sir.

Senator WARNER [presiding]. Go ahead.

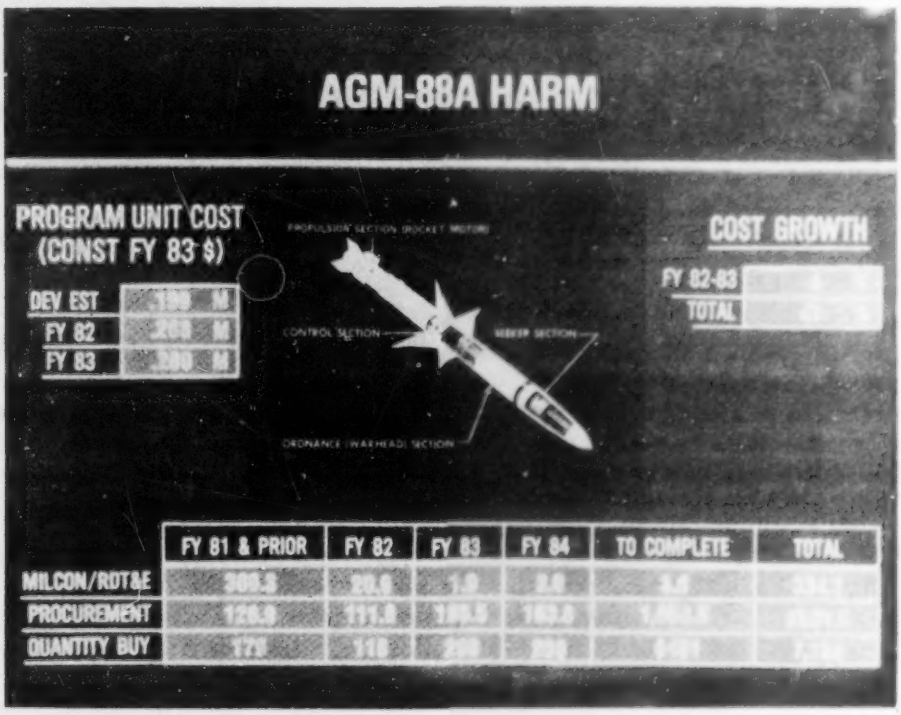


Admiral MCDONALD. Proceeding to Harpoon, which is our antiship standoff weapon, the fiscal year 1983 procurement request is

for $266.7 million for 231 missiles, of which 110 are for aviation. Of course, Harpoon is also used on ships and the 110 of the 231 will come to aircraft.

As I explained before you came in, Senator Warner, the Harpoon is now integrated into the A-6 as well as the P-3B MOD, P-3C, and the A-7, F/A-18 aircraft and the S-3.

The program unit cost has decreased 13 percent from fiscal year 1982 to 1983 in constant 1983 dollars. The program unit cost has increased 62 percent from the development estimate of $683,000 to $1.1 million.



HARM, which is an antiradiation defense suppression weapon, is probably one of the most vitally needed weapons we will carry on tactical aircraft at sea or on land. The fiscal year 1983 request is for $185.5 million for 208 missiles. The program unit cost has increased 4 percent from 1982 to 1983. The program unit cost has increased 41 percent from development estimates of $199,000 to $280,000 in constant fiscal year 1983 dollars.

Again, that weapon system is in the process of being tested right now. We do not have any in the inventory. We hope to have them very shortly in the inventory. As I say, it is an absolutely vital link in our ability to offset the enemy's capability in radar warning and to shut down some of his missile-control radars.

AGM-65E LASER MAVERICK

FY 83 PROCUREMENT REQUEST

$ 33.1 M

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	8.8	1.0	-	-	-	9.8
PROCUREMENT	-	6.0	33.1	49.5	268.5	356.1
QUANTITY BUY	-	-	90	350	3050	3490

Laser Maverick, which we discussed briefly, is a U.S. Marine Corps close air support air-to-surface weapon. The fiscal year 1983 procurement request is for $33.1 million for 90 missiles. The program unit cost has decreased 6.9 percent from 1982 to 1983.

With your permission, Senator, I would like to just briefly go into Other Procurement, Navy, and cover that and then we will be open to any other questions you may have or questions for the record.

The Other Procurement, Navy appropriation reflects a total of 1983 budget request of $3.970 billion. Of that amount though, $336.1 million, or 8.2 percent of the total, is under the cognizance of this subcommittee. The $326 million includes funding for three categories—$59.9 million for aviation communications and electronics equipment, $180.1 million for air-launched ordnance, and $86 million for aircraft support equipment.

In the aviation communications and electronics equipment, the $59.9 million provides for the procurement of equipment to be installed in Navy and Marine Corps shore activity, shipboard aircraft control equipment and secure communications systems, the Marine air control and landing systems which will provide fully automatic air traffic control and landing systems, and it obviously gives the Marines much greater capability in a safe way to handle their aircraft when they are operating in an expeditionary field and certainly around the bases here.

It also is a sort of an extension of our carriers where we have provided that type of control for our carrier aircraft.

TACAN is in this procurement with the AN/URN-25 which is our basic short-distance navigation system. The fiscal year 1983 budget request of $12.2 million is for the procurement of 16 of

these on the shore side of the house to replace the old equipment at the naval air stations, and 15 of the shipboard beacons to replace older equipment as part of the fleet modernization program.

Then there are moneys in there to update the fleet area control and surveillance facilities, or FAC/SAX, which control our aircraft operating offshore and integrate that with commercial transportation which flies back and forth from Jacksonville Fla., to Washington and particularly in those areas that we are operating and we transit through.

In air-launched ordnance we are talking to the procurement of air munitions such as bombs, rockets, machineguns, ammunition, FLIR, CHAF and other types of equipment like that. There is $180.1 million in that. It also provides for procurement of laser-guided bomb kits which will be used to provide terminal guidance for the Mark 82, Mark 83 and 64 general-purpose bombs; $13.2 million in this 1983 request will also continue the modernization of the Navy's inventory of Walleye, which is an air-to-surface TV-guided bomb; $26 million is for the procurement of Mark 76, Mark 106 and Mark 80 series practice bombs. Those are the ones we drop in great quantity on our bombing ranges to develop our accuracy without dropping the real ordnance.

Lastly, the aircraft support equipment—$86.1 million. The funds in this category provide for the procurement of a diverse group of equipments in support of naval aviation in the broadest range and we are talking to such things as $29.6 million for the procurement of equipment of collect, transmit, process, and display data collected during exercises at various training ranges, down at the Puerto Rico underwater range and the Pacific missile range at Point Magu; $6 million is for the procurement of drone-control systems and $2.5 million is for the procurement of radar and bomb-scoring system. You can see that fills in the other areas that help us deploy our aviation expertise.

Senator, that, in a very brief summary, is the other procurement, Navy submission.

Senator WARNER. If there is nothing further in the direct presentation, the staff has prepared these questions. In the judgment of the staff and the chairman, the record should reflect these answers.

If you are unable to give them at this time, we will ask they be placed in the record.

General White, last year there appeared to be a Marine position that the UH-60 would not be an acceptable aircraft to replace the CH-46. At that time the Marines were more interested in the reengined CH-46 than possible further application of tiltrotor technology. Do the Marines now consider the UH-60 to be an acceptable aircraft for your medium lift requirements? How many UH-60's are required to meet those requirements?

General WHITE. Senator Warner, talking about the Army's Blackhawk or UH-60, the Marine Corps in attempting to fill inventory shortfalls has looked at several aircraft that are either in production or could be put into production; therefore, we classify them as off-the-shelf helicopters. The UH-60 certainly is one of the candidates, along with our present CH-46. We have been studying this problem for some time. Hopefully during this spring—and I cannot

specify a date—we will come to a decision and enter into next year's defense budget.

Senator WARNER. On the A-7B I am told that the sale of the A-7B to Portugal is siphoning off some of the T-30 engines reserved for the A-7B. Is that true? How many engines are involved? What is the impact and availability of the A-7B? How many bare fire walls do we have in our A-7B reserve fleet? In your opinion, what is the impact of the reserve training?

Admiral MCDONALD. I would like to provide that for the record, since it is a complicated question. It does delve into subjective judgments and a quantifiable answer.

[The information follows:]

TACTICAL WARFARE

Admiral MCDONALD. Yes, however, the value of the sale of A-7P's to Portugal gives this important NATO ally a strong tactical capability and offsets any temporary impact on U.S. Navy capability.

Senator WARNER. How many engines are involved?

Admiral MCDONALD. Twenty-four TF-30 P408 engines have been provided through FMS to Portugal in A-7P aircraft.

Senator WARNER. What has been the impact of this on the availability of our Reserve A-7B's?

Admiral MCDONALD. Twenty-two percent of all A-7B's have been unavailable to fly as a direct result of the A-7P programs.

Senator WARNER. How many bare firewalls do we have in our A-7B reserve fleet as a result of this action?

Admiral MCDONALD. Fourteen Reserve A-7B bare firewalls are directly attributable to the A-7P program.

Senator WARNER. In your opinion, what is the impact of this action on the readiness and training of those Reserve squardrons?

Admiral MCDONALD. A-7B maintenance crews are continually changing engines to keep aircraft flying to take advantage of the few good engines for aircraft otherwise in an up condition. However, this is causing engine life to be used up at a much greater rate than programed. Despite these efforts, training and readiness are suffering as flight hour programs and training schedules fall behind. The projected get well date to have an engine in every aircraft is March 1983.

Senator WARNER. I think this next question on the F-18 Lantirn should be answered for the record. It has seven parts to it likewise. We have good staff here and are proud of them.

Admiral MCDONALD. We, too, sir.

Senator WARNER. The Air Force plans for secure voice includes the Have Quick system for the near term and Seek Talk for the long term. The Navy is also planning to procure the Have Quick. Is the Navy interested in the Seek Talk? If not, why not?

Admiral MCDONALD. Admiral Monroe will discuss that.

Admiral MONROE. I can give you a quick and general answer. We are in the process of procuring Have Quick for one battlegroup of ships, F-14's and E-2C's—to take it out and see how it performs at sea. We will use the Have Quick applique with the new combination UHF/VHF radio.

The present plan also involves buying two more battlegroups' worth as soon as the first ones test out.

After that, we still have to make the decision as to whether to continue buying more Have Quick systems, or to pursue some other alternative, prior to the time that JTIDS, the long-term solution to anti-jam and other requirements, becomes operational in

the late 1980's. There is an open period between about [deleted] for which we have not yet selected the alternative; however, [deleted].

If I could provide amplification for the record——

[The information follows:]

TACTICAL WARFARE

The Navy will procure an anti-Jamming applique to the USAF ARC 164 UHF radio designated Have Quick for utilization with the ARC 182 UHF/VHF radio [deleted]. JTIDS is the only long-term system under joint development to satisfy Line-of-Sight (LOS) and relay of voice and data.

Senator WARNER. As Senator Goldwater mentioned earlier a group of us are going to have lunch with the President. Of course, we want to support this defense program. I am hopeful that the Congress will not take cuts. If cuts are necessary, then the last cut should come in the area in which all of you are working right now—the upgrading of our systems.

We have a good momentum built up now. I hope we can keep it up.

Thank you.

Admiral MCDONALD. Thank you, sir.

[The following questions submitted by Senator Barry Goldwater to be answered for the hearing record:]

QUESTIONS SUBMITTED BY SENATOR BARRY GOLDWATER

COST GROWTH

Senator GOLDWATER. Admiral McDonald, the Navy was requested to provide the cost growth experienced in your tactical programs for whch SAR's are available. It was specified that this figure should be the cost growth adjusted for quantity in base year dollars. Except for the F/A-18, this was not done. Would you please provide for the record the cost growth adjusted for quantity (in base year dollars) for each of your tactical SAR programs.

Admiral MCDONALD. The cost growth associated with fiscal year 1983 tactical programs for which SARs are available follows:

COST GROWTH OF BASE YEAR ESTIMATE ADJUSTED FOR QUANTITY

Weapon system	Percent	Base year
AV-8B Harrier	9.5	1979
F/A-18 Hornet	27.2	1975
F-14 Tomcat	28.9	1969
CH-53E Super Stallion	31.0	1973
AGM 88A Harm	34.3	1978
A/R/UGM-84A Harpoon	32.8	1970
AIM-54 A/C Phoenix	53.3	1963
AIM/RIM-7M Sparrow	19.8	1968
AIM-9M Sidewinder	7.7	1976

F/A-18

Senator GOLDWATER. Admiral McDonald, the cost of the Air Force's LANTIRN program has risen dramatically. There are some who think the F/A-18 FLIR could be modified to perform this mission at a much lower cost. What is your assessment of this proposal?

Admiral MCDONALD. The F/A-18 FLIR is nearing completion of development, but that development, including the incorporation of a laser ranger/designator, has been delayed due to the $35 million R&D cut in funding in fiscal year 1982. The only remaining development is optimization of its integration into the F/A-18. The

requirement for resolution is [deleted] with [deleted] having been demonstrated. The Navy has received an unsolicited proposal from Ford Aerospace to build a pod that will meet the LANTIRN requirement. All WRA's would be 100 percent common and compatible with F/A-18, F-16, A-10, and F-15 type airplanes. Changes to the existing F/A-18 FLIR include: (1) add a laser designating capability, (2) add improved optics to meet a [deleted] requirement, (3) add Automatic Target Recognition Capability and, (4) add a cooling module. Although space is available in the Current F/A-18 FLIR for the laser designator, funding has not been provided to date. The Navy assesses incorporation of the laser designating capability and the addition of improved optics as low risk. A prototype has already been built and will fly this summer on an F-15. The Navy urgently needs the laser designator and could incorporate the capability in FLIR pods to be delivered in June of 1984 if funding could be provided by 1 April 1982. The Automatic Target Recognition capability is a higher risk development.

Senator GOLDWATER. What is your estimated cost to execute this program (both Research and Development and Procurement)?

Admiral MCDONALD. The budgetary estimates obtained from Ford and MACAIR to develop the entire system utilizing the F/A-18 is approximately $100 million over fiscal year 1982, 1983, 1984, and 1985. The per unit cost of production pods, assuming a June 1982 turn on and a 300 pod buy is approximately $1.5 million.

Senator GOLDWATER. Would your system be capable of performing the Automatic Target Recognition function?

Admiral MCDONALD. Yes. Of the $100 million in R&D over $70 million would be required to develop the Automatic Target Recognition capability.

Senator GOLDWATER. Would your system perform all of the functions required by the Air Force?

Admiral MCDONALD. I understand it would. A module would be added to the aft end of the pod to provide cooling for those airplanes which cannot themselves provide cooling. Also, the R&D cost would include the development of a navigation FLIR attached to the parent FLIR pod which could be utilized for terrain following. This navigation FLIR would be offered as an option.

Senator GOLDWATER. What IOC would you project?

Admiral MCDONALD. If the laser designator were turned-on by June 1982, capability could be in the fleet on F/A-18's by June 1984. The entire advanced FLIR pod could be available as early as June 1986, if turned-on by June 1982.

Senator GOLDWATER. If the Navy were to develop this system, would you also procure it for your own aircraft?

Admiral MCDONALD. Yes. If both the Navy and Air Force bought a common system, the advanced pod would become competitive in price with the present pod but with significantly enhanced capability.

TAC WARFARE

Senator GOLDWATER. The Air Force plan for secure voice include the Have Quick system for the near term and Seek Talk for the longer term. Is the Navy also planning to procure Have Quick?

Admiral MCDONALD. The Navy will procure an anti-jamming applique to the USAF ARC 164 UHF radio designated Have Quick for utilization with the ARC 182 UHF/VHF radio.

Senator GOLDWATER. Is the Navy interested in Seek Talk?

Admiral MCDONALD. No.

Senator GOLDWATER. If not, why not?

Admiral MCDONALD. [Deleted.]

Senator GOLDWATER. Will JTIDS meet the future requirement for tactical secure voice communication?

Admiral MCDONALD. Yes, [deleted].

Senator GOLDWATER. What IOC do you project for JTIDS?

Admiral MCDONALD. [Deleted.]

RF-4B

Senator GOLDWATER. General White, last year the fiscal year 1982 amended budget request contained initiatives for RF-4B aircraft which began to redress the need for real-time information to the battlefield commander. In particular, the amended budget provided for the UPD-4 Side Looking Airborne Radar (SLAR) and the ALQ-125 Tactical Electronic Reconnaissance (TEREC). There does not appear to be any funding for these systems in the fiscal year 1983 request. Has the Marine Corps changed the requirement for these battlefield systems? Are there alternative

systems which would provide the required capability? Are there plans to reprogram funds to complete the improvements to the RF-4B? What are the funding requirements to complete the UPD-4 and ALQ-125 equipage?

General WHITE. The Marine Corps has not changed the requirement for either the UPD-4 Side Looking Airborne Radar (SLAR) system or the ALQ-125 Tactical Electronic Reconnaissance (TEREC) system.

There are no alternative Systems which would provide the required capability.

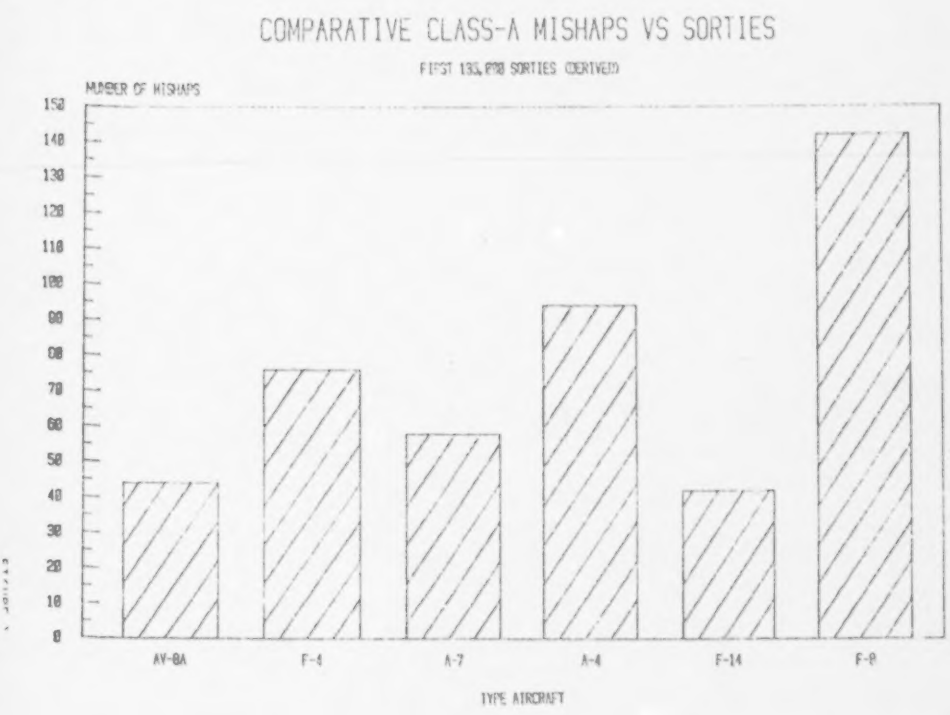
At present no funds have been identified for reprogramming to complete the improvements to the RF-4B.

The Funding requirements to complete the real time UPD-4 and ALQ-125 systems is $50M.

AV-8A

Senator GOLDWATER. General White, since the aircraft accident rate based on flying hours may not adequately consider sorties flown, would you provide for the record a sortie rate accident comparison? It would be useful if this comparison addressed accidents per sortie for the AV-8A, the A-7E, A-4, F-4, and F-18.

General WHITE. The AV-8A is a concept prototype aircraft which represents a significant departure from what has gone before. The total U.S. flying experience in this aircraft amounts to approximately 135,000 sorties. Figure 1 compares the AV-8A with other fighter and attack aircraft at the same aggregate sortie points. This comparison reflects the same relative experience level in each type aircraft, rather than attempt to compare aircraft in their maturity with a concept prototype. Figures for the F/A-18 are not available in time for this response; however, the F-14 has been added.



QUESTIONS SUBMITTED BY SENATOR STROM THURMOND

Senator THURMOND. Admiral McDonald, in your testimony you stress the importance of the carrier battle group and our efforts to reach the 15 group goal. Battleships are being brought out of retirement to enhance our capability until we reach

15 carrier battle groups. What systems are being incorporated in the battleships to compensate for the massive firepower found in a carrier air wing.

Admiral McDONALD. Our battleships are presently equipped with both 16 inch and 5 inch guns. As they become reactivated, they will be outfitted with the Tomahawk and Harpoon missile systems. The Phalanx, close in weapons system will also be installed. With this combination of firepower, the battleship will become the center of a surface action group which could effectively operate in a power projection or sea control mode in many contingency type operations.

MISSION CAPABILITY

Senator THURMOND. Admiral McDonald, you stated that Navy aviation currently falls short of a 70-percent rate for Mission Capable aircraft. What is the current percentage of Mission Capable aircraft?

Admiral McDONALD. The Department of the Navy (DON) Total Force Mission Capable (MC) rate for fiscal year 1982 is currently averaging 61 percent.

Senator THURMOND. When do you foresee reaching the goal of 70 percent?

Admiral McDONALD. We anticipate reaching the 70-percent MC goal by the end of fiscal year 1988.

F/A-18

Senator THURMOND. Mr. Paisley, what were the deficiencies in the F/A-18 during the fiscal year 1981 operational test and evaluation?

Mr. PAISLEY. The initial operational evaluation (OPEVAL) assessed the potential operational effectiveness and operational suitability of the F/A-18 for the Navy and the Marine Corps' strike-fighter missions. At the time of the test, the attack capability of the F/A-18 was not fully developed, with significant air-to-ground radar software modes not completed. Nevertheless, the Operational Test and Evaluation Force evaluated some air-to-ground capabilities as part of the fighter operations and identified some radar limitations. The effectiveness of F/A-18 attack capability is to be evaluated by the Navy in an attack-version OPEVAL in late 1982.

The initial (strike-fighter) OPEVAL considered the F/A-18's roll-rate to be deficient. However, none of the airplanes used in the evaluation had all of the modifications designed to improve roll-rate. Roll-rate improvements since the initial evalution have eliminated this deficiency.

A previously unidentified, very-slow-rate spin mode resulted in the loss of aircraft number F-12. Spin recovery would have been implemented automatically by the flight control computer sensing a yaw rate threshold of 50° per second and providing full flight control authority. Since the low yaw rate of 40° per second was not detected by the computer as a spin, the pilot could not acquire full control authority for spin recovery. A switch was subsequently installed in the cockpit to permit the pilot to manually switch to full control authority. Spin recovery has since been successfully demonstrated in over 100 spins from all spin modes and various symmetrical and assymmetrical loadings, including three tanks.

During the initial (strike-fighter) OPEVAL, the F/A-18 achieved a full-mission-capable rate of 64 percent. This compares with 80 percent goal for the F/A-18 at maturity. Fleet experience has demonstrated operational readiness in excess of 75 percent, and confidence is very high that further growth will be realized.

Escape system capabilities were considered deficient, in that the headbox design resulted in possible pilot incapacitation on ejection. Design improvements have since eliminated this deficiency.

The Operational Test and Evaluation Force concluded that the F/A-18 has the potential to be operationally effective as a fighter and recommended provisional approval for service use.

SPARROW MISSILE

Senator THURMOND. Mr. Paisley, in your statement you mentioned the failure in tests of the Sparrow missile. What was the nature of these failures?

Mr. PAISLEY. During the initial phase of operational testing we experienced failures in both the performance and the reliability of the missile. [Deleted.] Specifically, [deleted]. One failure occurred [deleted]. In both these scenarios the missile was [deleted].

Additional testing has been conducted since the IOT&E was suspended using missiles [deleted]. This test sequence is considered technical testing, although some of the scenarios were identical to those in which failure resulted in previous operational testing. In particular, [deleted].

We also suffered reliability failures in the captive-carry environment in the operational tests, where the missile is carried in repeated flights under the wing of an airplane in a ready-to-fire condition. [Deleted.] Corrective actions have been taken for all these failures and the results of these actions have confirmed in follow-on development testing with missiles incorporating the files. We now have to recommence our suspended operational testing and see if the missiles hold up under operational conditions. All production missiles will have the fixes.

LASER-GUIDED BOMBS

Senator THURMOND. Mr. Paisley, you have stated that you desire to qualify Navy attack aircraft to carry Air Force Mark 82 and Mark 84 low-level laser-guided bombs. You also stated that this action would require reprogramming. From what other areas do you desire to reprogram funds, and in what amounts?

Mr. PAISLEY. The Navy has a strong desire to participate in current Air Force environmental and HERO testing to reduce non-recurring costs for LLLGB. Funding sources being investigated for reprogramming, include laser-guided bomb procurement. Liaison with Air Force and contractor personnel indicate 1-2 million dollars is the optimum funding.

QUESTIONS SUBMITTED BY SENATOR JOHN W. WARNER

Senator WARNER. Admiral McDonald, one of the most valuable aircraft in the Navy's inventory is the A-6E. What is the current inventory objective for the A-6E?

Admiral MCDONALD. The A-6E inventory objective at the end of fiscal year 1987 is 316 aircraft. This inventory objective is based on a ten-aircraft PAA for 14 Navy and 5 Marine Corps squadrons.

Senator WARNER. Counting the 8 aircraft requested in this budget, where do we stand in meeting the requirement?

Admiral MCDONALD. The current FYDP procurement profile supports this inventory objective.

Senator WARNER. By going from an annual production rate of 12 to 8, what is the unit cost increase?

Admiral MCDONALD. Reducing the procurement from 12 to 8 aircraft in fiscal year 1983 increses the program unit cost by $5.5 million.

Senator WARNER. In your personal opinion, with two CVN's requested to support 15 Carrier Battle Groups and with the Navy's intention to provide A-6E's to the Reserve, is the presently planned rate of procurement adequate to meet all your requirements?

Admiral MCDONALD. No. Procurement of additional A-6E's will be required to support the 15th Carrier Battle Group and Naval Air Reserves.

Senator WARNER. What is the projected A-6E requirement for the Naval Air Reserve?

Admiral MCDONALD. To support two A-6E Reserve squadrons at a 10-aircraft PAA requires the procurement of an additional 30 aircraft.

Senator WARNER. Would you personally support 12 A-6E's in this budget as meeting a needed requirement?

Admiral MCDONALD. Although the preferred procurement rate is 12 A-6E's per year, budgetary constraints necessitated the reduction to 8 aircraft in fiscal year 1983. The current budget submit is a balanced budget; therefore, I would not favor an add-on at the expense of other Navy programs.

Senator WARNER. What is the dollar requirement to add four A-6E's to the current request?

Admiral MCDONALD. An additional $63.9 million would be required to procure 12 A-6E's in fiscal year 1983.

Senator WARNER. Does the fiscal year 1983 advance procurement request include funds for 12 A-6E's for fiscal year 1984?

Admiral MCDONALD. No. the fiscal year 1983 advance procurement is for eight aircraft in fiscal year 1984.

F-14

Senator WARNER. Admiral McDonald, for the past four years, and for the next four years of the FYDP (fiscal year 1984-88), the procurement rate of the F-14 is 30 aircraft per year. Yet for fiscal year 1983, there are only 24 F-14's requested. What is the reason for procuring only 24 for fiscal year 1983?

Admiral McDONALD. The 24 aircraft in fiscal year 1983 is simply a matter of budget priorities. While a procurement of a higher quantity of F-14's in fiscal year 1983 would reduce the flyaway unit cost of that aircraft, the acquisition profiles submitted for all aircraft are believed to be the optimum utilization of limited resources.

Senator WARNER. Isn't it more economical to maintain the production level at 30?

Admiral McDONALD. From a flyaway unit cost standpoint, it is more economical to procure 30 aircraft.

Senator WARNER. What is the unit cost difference between a 24 aircraft buy and a 30 aircraft buy?

Admiral McDONALD. The unit flyaway cost for 24 aircraft, including support, is $38.0 million; the unit flyaway cost for 30 aircraft would be $35.9 million.

Senator WARNER. With two CVN's requested for fiscal year 1983 and 15 Carrier Battle Groups planned, doesn't 30 F-14's represent a minimum annual procurement rate to meet the total F-14 requirement?

Admiral McDONALD. The planned procurement will transition fighter squadrons to the F-14 at a rate which keeps pace with the availability of F-14 compatible carrier decks.

Senator WARNER. In your personal opinion, what should be the annual procurement rate?

Admiral McDONALD. All things considered, the F-14 procurement rate should be the profile requested in this budget. While stepping the fiscal year 1983 buy up to 30 aircraft would lower flyaway unit cost, I would not like to do that at the expense of some other important program.

Senator WARNER. Are we getting F-14's into the fleet at an adequate rate?

Admiral McDONALD. Yes. We are transitioning fighter squadrons to F-14's at a rate equal to that of the availability of F-14 carrier decks.

Senator WARNER. What is the dollar requirement to add six F-14's to the fiscal year 1983 request?

Admiral McDONALD. The total program cost for 24 aircraft is $1178.6 million, including support and spares. The total program cost for 30 aircraft is $1,357.6 million, an increase of $179.0 million.

Senator WARNER. Does the fiscal year 1983 advance porocurement request include funds for 30 F-14's in fiscal year 1984?

Admiral McDONALD. Yes, the fiscal year 1983 advance procurement request does include funds for 30 F-14's in fiscal year 1984.

Senator WARNER. Is the F-14 a candidate for multi-year procurement? If not, why not?

Admiral McDONALD. Not at this time. The F-14 is undergoing some configuration changes which make multi-year procurement difficult for the next two or three years. The configuration changes include a computer expanded memory, a programmable signal processor in the radar, a TF-30 engine improvement program, and an improved defensive ECM suite.

Senator WARNER. What would the projected savings be over the FYDP, using multi-year procurement, and assuming the procurement of 30 aircraft per year?

Admiral McDONALD. Because we are not planning a multi-year procurement for the F-14 at this time, we cannot estimate what the savings might be.

AH-1T

Senator WARNER. General White, I note the Marine Corps is procuring the AH-1T Cobra Helicopters in fiscal year 1984. Could you procure any of these aircraft in fiscal year 1983 if funding were available?

General WHITE. Yes, a modest initial start in fiscal year 1983 would be possible and would help to alleviate current inventory shortfalls.

Senator WARNER. Does the Marine Corps have any plans to procure the AH-64?

General WHITE. The Marine Corps plans to add a night-capable attack helicopter to our force in the mid to late 1980's. The AH-64 appears to be a most effective way to accomplish this increase in helicopter force capability.

Senator WARNER. What is the difference between the AH-1T which the Marine Corps uses and the AH-1S used by the Army?

General WHITE. The Army's AH-1S is a single engine aircraft designed to operate in a land based environment. The Marine AH-1T is a twin engine, marinized aircraft designed to operate from a sea based environment and lift off at 14,000 pounds as compared to 10,000 pounds for the AH-1S. The transmission, drive train, rotor systems, and weapon systems are different.

Senator WARNER. The Army says the AH-1S could not be upgraded adequately to perform as well as the AH-64. How close to the AH-64 capabilities can the AH-1T come?

General WHITE. Some limited AH-64 capabilities could be incorporated into the AH-1T. For instance the Marine Corps plans to modify its AH-1's to carry the Hellfire Missile, however, the AH-1 could not lift AH-64 payloads or accommodate AH-64 nite vision systems without uprating the AH-1T engines. Additionally, the composite material survivability and reliability/maintainability advantages of the AH-64 would not be available in the AH-1T unless an R&D program was to be established to obtain those benefits.

Senator WARNER. What is the cost of the AH-1T compared to the AH-1S?

General WHITE. The 22 AH-1Ts being procured by the Marine Corps in fiscal year 1984 will have a procurement unit cost of 8.92 million dollars as compared to a procurement unit cost of 8.6 million dollars for a similar buy of AH-1Ss in fiscal year 1984.

JVX

Senator WARNER. Mr. Paisley, the Joint Services Advanced Vertical Lift Aircraft Development Program is a new program designed to develop a joint, multimission common aircraft to replace several new helicopters planned by all four services.

I understand the Navy may have the program manager for the project. Do you feel this is the proper approach to be taking in the development of a new aircraft?

Mr. PAISLEY. Yes, excellent cooperation and understanding have already been evident in the early stages of this development. With an Army-led program, a Marine as Program Manager, and all Services represented in the program office, I think it can only enhance the effort.

Senator WARNER. Would this be another TFX which we experienced in 1960's?

Mr. PAISLEY. Hopefully, we have learned the lessons of the 60's and could avoid those pitfalls. This program is ahead already by having agreement among the Services on the need for this development, and on the fact that trade-offs and compromise are necessary.

Senator WARNER. What type of aircraft do you envision evolving from the program?

Mr. PAISLEY. It would be an advanced rotorcraft.

Senator WARNER. Would you anticipate the Tilt-rotor concept to be a strong competitor?

Mr. PAISLEY. Yes, I would.

Senator WARNER. What is the total number of aircraft anticipated for future procurement by the Navy and for what missions?

Mr. PAISLEY. We are currently projecting approximately 550 aircraft for the Marine Medium Assault Mission and possibly some for Navy Combat Search and Rescue. However, the Navy will also actively explore other mission applications for JVX, or a JVX derivative, to achieve the widest possible utilization across the full spectrum of Navy needs.

Senator WARNER. General White, it appears that the Marine Corps is finally going to be able to procure the AV-8B. Are you satified with the AV-8B procurement rate for fiscal year 1983 and that reflected in FYDP?

General WHITE. Senator, I am aware of the fiscal constraints in Naval Aviation which led to the fiscal year 1983 request for only 18 aircraft; and the projections for the FYDP. But at the same time I am not satisfied with the fact that our light attack force will suffer a shortfall of some 35 aircraft by 1986 unless we are able to restore some 40 aircraft in the FYDP.

Senator WARNER. If you had additional aviation funding available, where would you apply it?

General WHITE. Concomitant to our real need to get the AV-8B program established at an economical production rate, our need for a two-seat version of AV-8B is foremost in our priorities. We must be able to train our V/STOL pilots in a safe and effective manner. We would certainly apply additional RDT&E funding toward this effort.

Senator WARNER. What are the plans for purchase of a trainer for the AV-8B? How could these plans be funded for the least cost? Why can't you use the trainers already purchased, the TAV-8A?

General WHITE. After extensive analysis, we have concluded that the 2 seat version of the AV-8B has more training value, is more cost effective, has more growth potential, is combat capable, has a warm production line, is 90 percent + common with AV-8B (therefore more supportable) and has longer service life (6000 hrs vs.

3000 hrs of TAV-8A), and, therefore, should be procured as a trainer for the AV-8B. Although trainer procurement funding is included in the FYDP, RDT&E funding has not been identified. Approximately $20 million in fiscal year 1983 could get this program started.

As you may be aware, procurement funding for 24 two-seat versions (90 percent + common with AV-8B) was included in the September 1981 AV-8B profile. This assumed that the production profile remained intact and was designed to control program costs. The 1983 budget and January 1982 FYDP profile dramatically reduces our flexibility with regard to purchase of a two-seater from funding within the parent AV-8B program. An additional concern is the up front RDT&E funding requirement. Best estimates indicate that $20 million in 1983 for RDT&E could get this important program started.

We currently have seven TAV-8A aircraft in the inventory. Studies to date indicate that TAV-8A performance and equipment differences with the AV-8B far outnumber similarities. In fact, the AV-8B and TAV-8A today are entirely different aircraft, even if substantial and costly system changes were to be made to the "A".

Senator WARNER. What are the technical improvements made to insure that the AV-8B is a safe as well as capable aircraft?

General WHITE. The superb combat capabilities of the AV-8B have been developed in parallel with very significant improvements in both V/STOL flight characteristics and the improved Pegasus-406 engine. The NASA/McDonnell-Douglas/British Aerospace aerodynamic improvements which have permitted doubling the range or payload, have also reduced the thrust borne to wing borne transition phase of flight from a 60 knot band in the AV-8A to a 12 knot band in the AV-8B. Incorporation of a fully active, state-of-the-art, stability augmentation attitude hold system (SAAHS) has been demonstrated in the FSD AV-8B as reducing dramatically the pilot workload, compared to the AV-8A.

The following items summarize the major AV-8B improvements which provide the foundation for our high level of confidence in the flight safety characteristics of the new AV-8B:

Improved flight visibility for the pilot.

Modern cockput displays and switchology with proven systems (including use of applicable F/A-18 systems).

Hand-on-throttle and stick (HOTAS) for those systems essential to flight and those critical to combat mission accomplishment (reduced pilot workload).

Supercritical wing for high cruise efficiency, better handling characteristics, low speed airfoil effectiveness, and more fuel capacity. Increased reaction control/thrust control moment in V/STOL flight.

Stability augmentation attitude hold system (SAAHS) for handling ease in V/STOL flight regime.

Lift improvement devices (LIDS) for improved stability and vertical lift margins for VSTOL takeoff/landing capability phase of flight.

Engine Improvements: F406 Engine (500 Hour Hot Inspection for reduced inspection requirements); New Shrouded LP-½ Turbines; New wide root front fan and blades which remove all adverse harmonic vibration impulses for normal flight; Improved reliability/maintainability by correction of all service revealed deficiencies of the AV-8A engine (F402); Improved fuel efficiency; Improved corrosion resistance; Increased maximum thrust performance; and Reduced logistical support costs.

Senator WARNER. With a concentrated effort, can an IOC of 1990 be reached?

Admiral MCDONALD. Technically, an IOC of 1990 may be achievable; but, that would assume that the developer would be free from the normal programmatic restrictions and impedences which accompany any project of this sort. The program plan has not solidified at this point so it would be too risky to categorically state when the IOC can be achieved. I think it would be more prudent to expect an IOC in 1991.

Senator WARNER. Because of a joint concept, can we expect a shortened development cycle?

Admiral MCDONALD. I do not expect it to be shortened by virtue of being a joint effort, alone. However, I do expect that this project can be accomplished more expeditiously through application of the administration's new acquisition initiatives.

Senator WARNER. Can significant cost reduction be expected with this type of joint development?

Admiral MCDONALD. Because of the sharing of the total R&D cost, it will be much less costly for each of the services individually. Also, the cost to the government as

a whole will be much less costly than if each service attempted to meet its own mission requirements in separate ways.

Senator WARNER. To your knowledge, is each service an active and agreeable participant in the program?

Admiral MCDONALD. Both the Secretary of the Navy and the Chief of Naval Operations have made clear that they are solidly behind this program. It is difficult to judge the totality of support in the other sevices, especially since we have not yet determined the aircraft's specific configuration, performance characteristics or cost. I believe that all the services do agree with the overall goals of the program, but there are variances in the sense of urgency.

Senator WARNER. What are the funding requirements to provide for a program to meet the IOC mentioned above?

Admiral MCDONALD. We are not sure yet. There have been a number of studies in the past which reflected widely varying cost estimates. We have just completed a Tentative Joint Requirements paper and that is being used by an Army-chaired Technical Assessment group to determine where feasibility and cost vs. performance tradeoffs must be made. We will be going through the process of making those tradeoffs in the late spring-early summer. We should have an accurate fix on costs by mid-summer, but until we get through this tradeoff process, I could only offer a guess.

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Senator WARNER. With a concentrated effort, can an IOC of 1990 be reached on the Joint Services Advanced Vertical Lift Aircraft.

General WHITE. Technically, an IOC of 1990 may be achievable; but, that would assume that the developer would be free from the normal programmatic restrictions and impedances which accompany any project of this sort. The program plan has not solidified at this point so it would be too risky to categorically state when the IOC can be achieved. I think it would be more prudent to expect an IOC in 1991.

QUESTIONS SUBMITTED BY SENATOR HOWARD W. CANNON

SPARROW MISSILE (AIM-7M)

Senator CANNON. Admiral McDonald, has subsequent testing been conducted on the AIM-7M since operational testing was suspended last year?

Admiral MCDONALD. Yes sir. Additional testing has been conducted since the IOT&E was suspended using missiles retrofitted with a new computer program.

Senator CANNON. What kind of testing is this—operational or developmental testing?

Admiral McDONALD. This test sequence is considered technical testing, although some of the scenarios were identical to those in which failures resulted in previous operational testing. In particular, the solution to the maneuvering target problem was verified in two successful firings in two attempts in which IOT&E scenarios were repeated.

Senator CANNON. Have these tests resulted in [deleted] successful shots of [deleted] attempts—for a success rate of [deleted].

Admiral McDONALD. There have been [deleted] full successes in firings, and all test objectives for guidance and proximity fuzing were met in a sixth test which was counted a failure for scoring purposes because of a reliability failure [deleted].

Senator CANNON. Admiral McDonald, I understand that Navy and Air Force operational tests of the AIM-7M SPARROW missile took place during June and July of 1981. I also understand that those operational tests were suspended because of poor missile performance. Were the tests suspended after eight missile firings resulted in only two successes—a success rate of 25 percent.

Admiral McDONALD. That is correct, tests were suspended and the technical Evaluation phase was re-opened. Eight of ten planned firings have been completed and design and production process changes have been made to improve the reliability of the missile. [Deleted] firings have satisfactorily met test objectives and have verified that problems seen earlier have been resolved.

Senator CANNON. Admiral McDonald, is it also true that earlier tests conducted by test agencies under Navy and Air Force development commander (Naval Air Systems Command and Air Force Systems Command) resulted in [deleted] successful firings from [deleted] attempts—for a success rate of [deleted].

Admiral McDONALD. That is true.

Senator CANNON. How do you account for these different results in testing?

Admiral McDONALD. Development test and evaluation (DT&E) is conducted under controlled conditions, with missiles and all other equipment in perfect condition, and with firings conducted by experts after numerous rehearsals. Operational test and evaluation (OT&E) is conducted under realistic combat conditions, with missiles and equipment in the normal day-to-day condition they will experience in the fleet, and with firings conducted by fleet-type personnel. In this case, some of the failures in the OPEVAL were caused by a design problem, and several tests revealed a design capability which was marginal. Specifically, two failures occurred against [deleted]. One failure occurred in a particularly demanding [deleted] and another at [deleted] a [deleted]. In both these scenarios the missile was operating near the edge of its design capability. Finally, two reliability failures occurred, indicating a reliability failure rate of 25 percent in these missiles.

Senator CANNON. How do developmental tests by the developing command differ from operational tests?

Admiral McDONALD. In general, OT&E is conducted by fleet-type personnel, under combat conditions, against a simulated enemy employing countermeasures. DT&E is conducted under rigidly controlled conditions—generally to test performance of the missile against specific design specifications—with engineers, technicians, and test pilots employing missiles and equipment that has been put in top-flight condition.

Senator CANNON. Admiral McDonald, what is the goal for mean time between failure for the AIM-7M during captive carry on an aircraft, and what mean time between failure has actually been achieved?

Admiral McDONALD. Our objective is to have the AIM-7M, when in fleet use, approach or match the reliability of the current AIM-7F missile, which is about [deleted] mean-flight-hours-between-failures (MFHBF). For the OPEVAL AIM-7M missiles, which are early production version, our required threshold for captive flight reliability, as stated in DCP-89B, is [deleted] hours. At the time the OPEVAL was suspended, the reliability test was incomplete, but MFHBF was considerably less than [deleted] hours. We have incorporated fixes in all production missiles to correct all the problems we have seen, and we hope to meet the reliability threshold requirements using these missiles when we recommence OPEVAL.

Senator CANNON. Admiral McDonald for fiscal year 1983 the Navy and the Air Force together have requested 1970 AIM-7M missiles for $331 million. What would be the level of procurement for fiscal year 1983 that would maintain a minimum sustaining rate of production, and how much would this level of procurement cost?

Admiral McDONALD. A typical minimum sustaining rate for fiscal year 1983 would involve each guidance and control section contractor producing 50 units/month. These would be divided 410/790 between the Navy and Air Force, at a cost to the two services of $116.3/$173.4 million for a total of $289.7 million. We expect to hold production rate to a low level until reliability and firing performance have

been proven in OPEVAL, thus we believe the risk here is relatively low. We expect to have the current problems resolved before we build the first unit of the fiscal year 1983 buy. A cut-back in production would affect competition in fiscal year 1983, the first year in which we expect to reap the benefits of nose-to-nose bidding between the two sources. If the production quantities were too low, we would have to make directed, non-competitive buys with both manufacturers at a significantly higher unit cost. Proceeding at the minimum rate cited above would mean we would lose 770 missiles (39 percent) from the planned buy, but save only a total of $41.7 million (13 percent) of the budget that we have submitted.

Senator CANNON. Admiral McDonald, will the Advanced Medium Range Air-to-Air Missile (AMRAAM) eventually replace the AIM-7 series of missiles for medium-range engagements beyond visual range?

Admiral MCDONALD. The Navy is committed to the joint-service development of AMRAAM as a follow-on to the medium range AIM-7 (SPARROW) series of radar missiles. The program is currently in full-scale engineering development, which is funded by Air Force RDT&E except for Navy-unique requirements for our OPEVAL. Based on current projections of schedule, production cost, and performance/reliability, we expect to procure AMRAAM—once it is fully developed and proven—as a successor to the AIM-7 series. However, the Navy's final decision on replacing the AIM-7M with AMRAAM will not be made until we have verified actual performance and reliability in our OPEVAL.

Senator CANNON. When will the AMRAAM be procured?

Admiral MCDONALD. The first Navy procurement of AMRAAM (other than RDT&E missiles) is expected to be in fiscal year 1987.

Senator CANNON. Admiral McDonald, the SPARROW program recently breached the Nunn threshold for program acquisition unit cost. What is the percentage increase for program acquisition unit cost over the March 1981 SAR baseline, and why has the cost increased?

Admiral MCDONALD. The percentage increase for program acquisition unit cost over the March 1981 SAR baseline is 32 percent in escalated dollars, 21 percent in constant dollars. The cost has increased because of a number of reasons: inflation in the aerospace industry is higher than we have been able to budget for; vendor costs to the prime contractors have been very high; and the Raytheon Company is projecting higher costs over the production run than they demonstrated on the AIM-7F missile. The fiscal year 1982 Congressional cut of $25.5 million, shared between the Navy and Air Force, also caused the unit costs to increase. We have begun a vigorous effort to reduce cost, which has included bringing the second source on line in order to compete the fiscal year 1983 procurement. We are redesigning specific microwave components of the missile to enhance producibility and reduce cost, and we are qualifying 63 additional sources for vendor-produced components.

AIRCRAFT MODIFICATIONS

Senator CANNON. Admiral McDonald, the Navy's request for aircraft modifications this year is $1.3 billion—a 41 percent increase over last year's level of $927 million. As I understand it, about $470 million of the $1.3 billion total is for capability enhancement—not modifications to correct safety of flight problems or to improve readiness. Is this correct?

Admiral MCDONALD. Yes, sir, that is roughly correct. In an attempt to define the requirements for aircraft modification we have categorized our program in terms of Readiness (reliability and maintainability improvements), Safety, Force Levels (SLEP/CILOP) and Capabilities (effectiveness). To respond to your question precisely, $466.4 million of the $1.3 billion is categorized as "capability" improvements. These modifications are driven by the requirement to upgrade older aircraft and weapon systems to keep pace with the current and emerging threat. It must be borne in mind, however, that virtually all "capability" improvements also include features that either improve reliability and maintainability, enhance safety or maximize force levels through force multiplication advantages.

Senator CANNON. Admiral McDonald, yesterday, Admiral Martini testified that the fiscal year 1983 Navy budget has only $214.4 million of the $317.2 million in required O&M funds for installation of modification kits. As I understand it, the fiscal year 1983 O&M budget will actually support installation of kits bought with fiscal year 1982 and prior year procurement funds. Is this correct?

Admiral MCDONALD. Yes, it is.

Senator CANNON. What will be the backlog in modification kit inventory at the end of fiscal year 1983?

Admiral McDONALD. Approximately 185,000 of the 275,000 items in the modification kit inventory at the end of fiscal year 1981 were procured with APN-5 funds (the remaining 90,000 were procured with OPN or WPN). We anticipate that improved management techniques and ongoing efforts to eliminate excess kits from the inventory will result in reducing the APN-5 modification kit inventory to less than 80,000 airframe and component kits by the end of fiscal year 1983.

Senator CANNON. Will this backlog grow by the end of fiscal year 1984 as a result of your request for $1.3 billion in procurement funds for modification kits?

Admiral McDONALD. We anticipate that the backlog will decrease because the fiscal year 1983 modification installation backlog is included in the fiscal year 1984 modification installation requirement.

Senator CANNON. How much do you expect this backlog to be by the end of fiscal year 1984?

Admiral McDONALD. We estimate that the APN-5 modification kit inventory will have decreased to approximately 70,000 airframe and component kits by the end of fiscal year 1984. We expect to reduce the kit inventory to an optimal working level by the end of fiscal year 1985.

Senator CANNON. Please provide for the record a list of modifications (in order of priority) that you would defer if funding for modifications were reduced by $100 million in fiscal year 1983. Also provide the spares funding that would be deferred as a result of the deferral of modification items.

Admiral McDONALD. It is impossible to prioritize a list of preferred deferrals because of the overall relationship of the various modifications to readiness, safety, force level extensions, and effectiveness upgrades. Such a list might be considered as a de facto representation of unnecessary modifications, which would definitely not be the case. Senator, you can be assured that the fiscal year 1983 list of required aircraft modifications is important and essential and severe overall impact on naval aviation would be experienced if $100 million were to be eliminated from the request. In any case, a determination of where to absorb any reduction, with the last possible setbacks, would need to be made as requirements are more closely developed in the 1983 timeframe.

Senator CANNON. Admiral McDonald, for this $1.3 billion of procurement of modification equipment, what are the accompanying amounts for initial spares in the fiscal year 1983 budget that are necessary to carry out the actual modifications of aircraft?

Admiral McDONALD. The spares cost associated with the aircraft modification procurement program in fiscal year 1983 is $147.4 million.

ADVANCE PROCUREMENT

Senator CANNON. I want to talk about advanced procurement funding for a moment. In those programs that are not proposed on multi-year procurement programs for aircraft, such as the F-14 and F/A-18 programs, will any of the advance procurement funds in the fiscal year 1983 request be used to fund long-lead items for procurement beyond fiscal year 1984?

Admiral McDONALD. Only the A-6E, EA-6B, CH-53E and C-2 contain advance procurement for more than one year. In these cases advance procurement was included for economic order requirements in future years associated with the portion of the program subject to multi-year procurement.

Senator CANNON. Specifically, will any of this advance procurement money requested for fiscal year 1983 support procurement in fiscal year 1985?

Admiral McDONALD. In all other instances, advance procurement was limited to one year's (1984) requirements.

Senator CANNON. Has the Navy's request for advance procurement funding this year been reduced to reflect the shortened lead times for raw materials, castings and forgings noted recently in Aviation Week?

Admiral McDONALD. No, in general, advance procurement has not been adjusted. In fact lead times in previous years actually exceeded one years advance procurement funding in some instances.

Senator CANNON. What are some specific examples of reduced advance procurement requests?

Admiral McDONALD. As noted in the Aviation Week articles, major raw material, forgings and castings vendors have recently become more responsive to new orders due to marked decreases in commercial demand. However, the forgings and castings industry has historically experienced peaks and valleys in total demand. For this reason the present lead time situation is viewed more as a temporary lull rather than a permanent trend. It is not expected to continue for three reasons. First, as

the economy improves, it is anticipated that commercial demand will increase, thereby reducing the excess capacity currently contributing to diminished lead times. Second, the introduction of the B-1 bomber and expansion of other Defense programs will create additional demand for long lead components. Finally, in response to the present industry-wide slow down, major vendors have reacted by reducing operational capability, particularly in the area of skilled labor. Because of these considerations, fiscal year 1983 advance procurement requests do not reflect shorter lead times. The advance procurement funding for the SH-60B has been reduced in the fiscal year 1983 APN budget, but this action reflects actual experience with long lead requirements vice the funding projections which served as a basis for the fiscal year 1982 requests.

Senator CANNON. Admiral McDonald, since fiscal year 1981, the F/A-18 funding for advance procurement has been about 9 percent of the flyaway cost of the aircraft to be procured. However, you are asking for advance procurement funding this year (to support procurement in fiscal year 1984 of 96 aircraft) that is 15 percent of the projected fiscal year 1984 flyaway cost. This change in rate of about 6 percent equates to about a $100 million increase in requirements. Why are you asking for a higher level of advanced procurement funds for the F/A-18 this year than you have asked for previously?

Admiral MCDONALD. F/A-18 advance procurement costs are developed from analyses of airframe, engine and GFE long lead requirements. In the aggregate, the analyses have resulted in annual termination liability requirements approximating 13-15 percent of the projected flyaway costs. The apparent change in funding levels is due to a computational error in the fiscal year 1981 budget an to fluctuating requirements in the fiscal year 1982 budget.

As previously stated, advance procurement funds are designed to provide termination liability coverage for the following year's aircraft. The 1981 budget request, however, was erroneously calculated on the basis of expenditure vice termination liability coverage. While the budget was sufficient to pay the actual cost incurred, it inadvertantly resulted in an unfunded termination liability during fiscal year 1981.

In developing the fiscal year 1982 budget the Navy requested $236.4 million in support of 84 aircraft in fiscal year 1983. This equates to approximately 14 percent of the projected flyaway cost for these aircraft. Similarly, in developing the fiscal year 1983 budget the Navy has requested $283.7 million in support of 96 aircraft in fiscal year 1984. Both of these requests represent approximately 14 percent of the flyaway cost and provide full termination liability coverage.

MEDIUM RANGE AIR-TO-SURFACE MISSILE (MRASM)

Senator CANNON. Admiral McDonald, in your prepared statement you state that: Navy MRASM is currently funded at the level necessary to provide development of all components common to both Navy and Air Force MRASM.

What does this mean as far as development and integration of a seeker for an anti-ship variant of MRASM is concerned?

Admiral MCDONALD. The anti-ship seeker for MRASM is undergoing captive flight tests at this time as a part of the guidance and control system development for MRASM.

Senator CANNON. Specifically, how much funding is in the Navy's research and development budget for development and integration of a seeker for an anti-ship variant of MRASM?

Admiral MCDONALD. About $7 million in fiscal year 1981 funds has been spent for the integration of the IIR Seeker and other components into the guidance and control system for Navy MRASM. Captive flight testing is ongoing in fiscal year 1982, and will continue in fiscal year 1983. Integration of the IIR Seeker is expected to be part of the [deleted] and subsequent effort.

SPARES REQUIREMENTS

Senator CANNON. Admiral McDonald, your written statement contains the following quote: "The fiscal year 1983 funding request provides for all current year spares requirements." Yet volume 2 of the Department of Defense Force Readiness Report shows on page D-8 a shortfall in spares funding of nearly $130 million in fiscal year 1983. How do you reconcile this apparent conflict between your testimony and the data reported in the force readiness reports?

Admiral MCDONALD. The Defense Readiness Report provided information for Navy secondary item procurement funding for all appropriations, including APN, WPN and OPN. The fiscal year 1983 unfunded requirement initially provided by the

Navy to OSD for the Defense Force Readiness Report included $13 million to OPN and $115 million to APN for initial spares.

It was subsequently determined that the figure provided for APN should be deleted based on final budget data for the APN initial spares program. The corrected information was passed to OSD, but not in time for the Defense Force Readiness Report to be revised. An addendum to volume 2 of the Department of Defense Force Readiness Report is being prepared to reflect this correction.

Senator WARNER. The hearing is adjourned.

[Whereupon, at 11:20 a.m., the subcommittee was adjourned, subject to call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

THURSDAY, MARCH 11, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

MARINE CORPS PROGRAMS

The subcommittee met, in executive session, at 8:58 a.m., in room 212, Russell Senate Office Building, Senator Barry Goldwater (chairman) presiding.

Present: Senators Goldwater and Cannon.

Staff present: Robert S. Dotson, George K. Johnson, Jr., Carl M. Smith, professional staff members; and Tamara L. Jones, staff assistant.

Also present Dennis P. Sharon, assistant to Senator Goldwater; Buzz Hefti, assistant to Senator Warner; Frank Krebs, assistant to Senator Cannon; and Gray Armistead, assistant to Senator Byrd.

OPENING STATEMENT BY SENATOR BARRY GOLDWATER, CHAIRMAN

Senator GOLDWATER. The meeting will come to order.

Good morning, gentlemen. Today the Tactical Warfare Subcommittee meets to receive testimony on Marine Corps tactical programs.

We welcome Lt. Gen. John Miller, Deputy Chief of Staff for Plans, Policies, and Operations; and Lt. Gen. W. J. White, Deputy Chief of Staff for Aviation, and all the rest of you gentlemen.

Gentlemen, it is a pleasure to have you here this morning. I am looking forward to learning more about your programs and requirements.

Please, proceed as you wish.

[The prepared statement of Lt. Gen. John M. Miller follows:]

PREPARED STATEMENT OF LT. GEN. JOHN H. MILLER, U.S. MARINE CORPS

Mr. Chairman, distinguished members of the Committee, once again it is a privilege to report to you on the missions, capabilities and tactical enhancement programs of the United States Marine Corps.

It is my intention to detail my views in relation to the following major areas: Marine Corps missions and roles in the defense of the nation, our capabilities and current readiness posture. Some of those programs we are sponsoring which will improve our capabilities and readiness. And finally, people and sustainability.

Let me begin by discussing the Marine Corps within the perspective of the national military strategy and, in particular, our maritime strategy. The Marine Corps, as

an integral part of the Naval Service, is a vital element in this nation's maritime strategy. That strategy is, of necessity, global in orientation and, as such, requires ready, responsive, and flexible forces capable of applying the entire spectrum of military options; from deterrence through presence to forcible entry when deterrence fails. Naval forces, sailors and Marines, provide the capabilities necessary to carry out their responsibilities inherent in the national strategy. They do so through the implementation of seapower.

The Navy and Marine Corps, as a team, serve as instruments for diplomacy and deterrence, as well as offensive power projection forces when required. The presence of amphibious task forces, both in routine forward deployments and in response to crisis situations, supports this nation's diplomatic goals by bolstering allies and friends, by performing humanitarian acts, and by contributing to regional stability. This same presence serves as a deterrent to those who would seek to undermine international stability.

Should deterrence fail, and our vital interests be threatened, this nation must be capable of projecting its power across the seas. In those areas of the world where no force presence exists on the ground, Navy/Marine Corps amphibious forces represent this nation's most viable forcible entry capability. Amphibious forces can seize and control strategic choke points and entry points, as well as establish advanced bases. Further, our force capabilities can be rapidly integrated with those of other U.S. and allied forces, which permits us to remain and fight alongside them in joint and combined endeavors. Considering the geopolitical realities of the present world situation, I am confident you recognize that such global reach and flexibility can take maximum advantage of our adversaries' vulnerabilities and, therefore, are vital to our defense.

The Marine Corps' fundamental mission is amphibious warfare. To accomplish that mission with maximum flexibility and capability we provide Fleet Marine Forces of combined arms, along with integral supporting air components, which serve as Landing Forces with the various numbered Fleets. We support those Fleets by exercising our capabilities to seize and defend advanced naval bases, and by conducting land operations necessary to the successful prosecution of a naval campaign. Marine forces supporting the Fleets are organized so as to be mission capable, that is, they are task organized. Task organization of forces is a basic tenet of amphibious warfare and permits us to "tailor" our forces for a specific mission, or mission area, and to organize and equip those forces so they are prepared to respond to the anticipated threat. By so doing, we provide potent, flexible, and mobile forces which can respond rapidly with a great deal of capability and, do so, economically. In short, Marine Air-Ground Task Forces (MAGTS's) provide significant capability for a comparatively low rate of investment.

As credible testimony to our readiness, Naval amphibious task forces have recently exercised in a number of Mediterranean countries; in Norway; throughout the Pacific Ocean area from Korea to Australia; in the Caribbean Sea; and with our friends in South America. This fall, Marines landed in Oman during Exercise Bright Star 82, which demonstrated the response capability of amphibious forces in Southwest Asia. These exercises amply underscore the inherent flexibility and capability of Marine forces to operate in various environments; jungle, desert, mountain, and under extreme weather conditions. Marines have also participated in a variety of humanitarian assistance projects.

I have provided you an overview of the Marine Corps' capabilities and current readiness. At this point, I will outline some of the programs designed to enhance our capabilities and maintain our readiness. My remarks, however, will primarily address Marine Corps "green dollar" programs. Lieutenant General White, our Deputy Chief of Staff for Aviation, is with me today and will respond to any aviation issues you may wish to discuss.

Tactics might best be described as the harmonious integration of three factors: maneuver, firepower, and control. I will address our enhancement programs in relation to those factors.

Maneuver on the modern battlefield, and in particular when facing the Soviets or their well-equipped surrogates, must be represented by a high degree of mobility. Tactical mobility provides the means to rapidly close with and destroy the enemy and to logistically support Marines in a highly mobile environment. In concentrating on "green-dollar" programs, I will not address helicopter programs, which are a very essential part of our overall mobility. There are three ground acquisition programs intended to improve our battlefield mobility. These are: a new family of light armored vehicles, the service life extension of our amphibious assault vehicles, and the High Mobility Multipurpose Wheeled Vehicle (HMMWV). The following paragraphs address these enhancements in more detail.

The Light Armored Vehicle (LAV) program is designed to increase both the mobility and firepower of the Marine division. Our acquisition efforts are directed toward the testing, evaluation and, ultimately, the selection of an "off-the-shelf" vehicle which will be modified to provide multipurpose service. Based on a common chassis, the LAV will be developed into a family of variants which will be integrated and organized into Light Armored Assault Battalions (LAABs). These battalions will not only provide combat support to other elements of the MAGTF but, if required by the situation, will be employed as a hard-hitting, fast-moving, helicopter transportable maneuver element. This provides a new dimension to our capability to engage and destroy highly mobile adversaries. The first LAV company will be formed at the Marine Corps Air Ground Combat Center, 29 Palms, California, in Calendar Year 1983.

In order to improve our maneuverability both on the battlefield and during the critical ship to shore movement phase of an amphibious assault, we have initiated a program to upgrade our assault amphibian vehicles (LVT-7); a program that will prove effective and economical. The LVT-7A1 will have a new engine and other improved subsystems and components. There are two aspects to the program. The primary aspect involves the Service Life Extension Program (SLEP) of the entire inventory of 984 LVT-7s which are to undergo product improvements to meet LVT-7A1 specifications. The second aspect provides for new production of 329 vehicles in the LVT-7A1 configuration, which will be used to support the Maritime Pre-positioned Ships (MPS) program and to meet our Table of Equipment and Pre-positioned War Reserve Stock deficiencies.

The High Mobility Multi-purpose Wheeled Vehicle is a new multi-functional vehicle which will streamline maintenance, training, and logistic support. Functionally, it will serve as a weapons platform, a communications vehicle, and a multi-purpose logistics carrier. Perhaps most significant are the cost efficiencies offered by this new family of vehicles. HMMWV will replace eight types of motor transport vehicles currently in the inventory and, by doing so, will virtually halve that inventory (26,000 current vehicles will be replaced by 14,000 HMMWVs)—all that, while increasing our lift capacity.

Programs to increase our firepower, my second tactical factor, are designed specifically to deal with the significant Soviet armor and mechanized threat. Included among those programs are: the MK-19 40mm Machine Gun; the Tube-Launched, Optically-Tracked, Wire-Guided Missile (TOW); Dragon; the M198 155mm howitzer; the Copperhead precision guided projectile (PGP); Modular Universal Laser Equipment (MULE); and two aviation ordnance programs.

The MK-19 is a recoil operated, fully automatic, grenade launcher designed to fire a 40mm projectile in excess of 2,100 meters. This weapon will be employed by infantry units to engage light armored vehicles and personnel. Twelve weapons will be placed in each infantry battalion for a total of 108 weapons in each Marine division.

Tow and Dragon inventories will also be increased. Our plans are to double the numbers of Tow's and increase our Dragon capability by 25 percent within each Marine Division. The Tow initiatives, in addition to increasing the number of weapons, call for beefing-up the warhead, extending its range, providing it with electrical-optical countermeasures systems, and night sights for acquiring and destroying targets in the dark. Dragon will also be provided with night sights.

Further, and in keeping with our doctrine of totally integrating our combined arms effort, our artillery units will be strengthened by programs designed to enhance their effectiveness in general and, in particular, their anti-armor/mechanized capabilities. Introduction of the M198 155mm howitzer as the primary direct support artillery weapon will significantly increase the lethality, range, and accuracy of our artillery units. Accuracy and lethality will be further improved by combining Copperhead Precision Guided Projectiles with Modular Universal Laser Equipment. These, in addition to the aviation delivered, anti-armor ordnance programs we are pursuing, will measurably enhance our anti-armor/mechanized capabilities.

Although not Marine Corps "green-dollar" funded, aviation Precision Guided Munitions (PGM's) are an area I feel deserves emphasis because of its combat value to ground forces. The magnitude of the Soviet tank threat requires air-delivered PGM's which can successfully engage enemy armor at standoff distances. We believe Hellfire and Laser Maverick are two such PGM's which can take on the threat and beat it without unacceptable aircraft attrition.

Hellfire is being procured for eventual use by our attack helicopter force. Our pilots will be able to fire the laser guided Hellfire at a tank which is laser designated from the ground commander, and then break away before entering the tank's

anti-aircraft killing zone. Our AH-1/Hellfire IOC of Fiscal Year 1986 will provide the ground commander will additional tank killing punch.

On the fixed wing side of Marine Aviation, Laser Maverick promises to offer the same type of aircraft survivability to our AV-8B, F/A-18 and A-4M aircraft that Hellfire will provide attack helicopters. It also offers tremendous target lethality with its unique 300 pound warhead, the largest on any U.S. anti-tank PGM. By providing the fixed wing community with an anti-tank weapon which, again the ground commander can control by laser designations, Laser Maverick furnishes additional safety for friendly forces which is so crucial to the type of close air support which Marine air provides Marines on the ground. With operational testing commencing in March 1982, Laser Maverick's planned IOC of Fiscal Year 1985 looks solidly achievable.

The third factor in the tactical equation is control. MAGTFs are organized, equipped, and trained to operate in a totally integrated combined arms structure, thus providing our commanders the capacity to control all elements of the team including ground combat, aviation and logistics. To that end, unique command, control, communications, and intelligence (C^3I) capabilities are required. The following programs for C3I systems will satisfy that requirement.

The Position Location Reporting System (PLRS), a Fiscal Year 1982 conference funding deferral, is designed to provide commanders and equipped units with instantaneous friendly position and identification information. In 1983 this joint Army-Marine Corps development could be in production with initial units scheduled for delivery to tactical forces in 1984. PLRS will interface with the Marine Integrated Fire and Air Support system, a realtime processing system which will be available in fiscal year 1987 to provide commanders selective automated assistance for accomplishing command, control, and coordination functions inherent to the employment of the MAGTF.

Our Tactical Air Operations Center-85 is a modular, state-of-the-art, air control systems that will replace current equipment which is approaching obsolescence. Its IOC of 1985 ensures that the Marine Corps will have a modern, deployable air control capability for the battlefield of the 80s and beyond.

To match the air control capabilities of TAOC-85, we are procuring the AN/TPS-59 Radar to provide a long range, three dimensional air defense surveillance radar. Because of its superior ECM capabilities, improved reliability and maintainability, and overall unsurpassed performance, the TPS-59 is recognized as the world's finest air defense radar. The 10 radar sets requested in fiscal year 1983 will initially be used with our present air control units and then ultimately with TAOC-85 when that system is fielded.

Another area of Marine Aviation in which we are improving our capabilities is ground air defense. The constant expansion of Soviet attack capabilities, illustrated by weapons systems like the Hind-D and Mig-27, demands improved air defense protection for our front line Marines as well as our vital rear area installations. These requirments are being addressed as quickly and as economically as possible through the acquisiton of IHawk Triad equipment, Stringer missiles, TAOC-85 Control Center and and AN/TPS-59 Surveillance Radar.

We are expanding our surface to air missile capabilities by adding a third firing section to each of our IHawk batteries in fiscal year 1983. This will increase each battery's simultaneous engagement capability from 2 to 3 targets, which is another way of saying that we will make it more difficult for the enemy to penetrate our air defenses. We will add an additional Triad (three firing sections) battery to each of our light antiaircraft missile (LAAM) battalions in fiscal year 1984. In addition to this IHawk Triad equipment enhancement, we are acquiring increased numbers of IHawk missiles to improve the sustainability of our LAAM battalions. The IHawk Missile System will be with us well into the 1990's, thus, we believe that these IHawk initiatives represent prudent, economical improvements.

Moreover, in fiscal year 1982, we are increasing our Forward Area Air Defense (FAAD) platoons from one to four platoons per aircraft wing. In fiscal year 1984, we will complete the expansion by adding a fifth platoon each wing. These platoons will be receiving the Stinger missile, an effective replacement for their current Redeye missile. As a matter of fact, our Third Marine Aircraft Wing at MCAS El Toro, California, has just recently completed outfitting one of their FAAD platoons with the Stinger missile. This first fully operational Stinger unit has been assigned to the 7th Marine Amphibious Bridage, as part of the Marine Corps' commitment to the RDJTF.

This then, provides an overview of some of the most important enhancement initiaties we are proposing. They are designed to enable the Marine Corps to face an ever-increasing and sophisticated threat posed by the Soviets or their surrogates.

Having previously addressed the "green dollar" programs to enhance our capabilities and readiness, I would like to turn now to the glue which holds them all together, our individual Marines. Our ability to deploy rapidly and accomplish our mission, wherever and whenever called, depends on quality individuals who can endure rigorous training, accept firm discipline, respond to sound leadership, and perform with intelligence and adaptability. Our quality has never been better. This continuing emphasis on quality has resulted in low attrition, fewer disciplinary problems, and progressive improvement in our career force since more qualified individual are eligible to reenlist and are doing so. All this adds to up to a ready, motivated, capable force.

Once our forces are deployed, they must have the wherewithal to remain until the assigned mission is accomplished. Sustainability, in combination with weapon systems and people, provides this capability and is worthy of your attention. In order to correct combat service support deficiencies, the Commandant directed the Fleet Marine Force Commanders, during September 1981, to activate previously cadred combat service support companies. The result will be the activation of units in all Force Service Support Group (FSSG) Functional areas by the end of fiscal year 1983. This sequence will include activation in the areas of ration, supply, landing support operations, fuel storage and distribution, bridging, and engineer support.

The activation of units in all functional areas within each FSSG provides the fully capable combat service support structure that must then be manned by Marines suitable for assignment to the FSSGs. Current manpower projections provide for progress in satisfying FSSG manpower requirements from the current 77 percent of requirement to 87 percent by 1987. This increase in the manning levels of the essentially complete FSSG structure will provide a substantial increase in the depth of capability within all critical functional areas. Finally, funding in the past year, and in the current budget, provides substantial ammunition and materiel increases.

In conclusion Mr. Chairman, I would like to reiterate my views on the maritime strategy and role of the Navy/Marine Corps team in implementing that strategy. As we in the Naval Service view it: maritime superiority, through the exercise of seapower, is vital to our nation's prosperity, our defense, and the maintenance of international stability.

As a nation with alliances and commercial/economic interests far distant from our shores, we must be assured of free and unthreatened access to the sea lines of communication. Beyond the maintenance of free access through sea lines of communication, our naval forces must be able to provide this nation with a credible deterrent capability and, should deterrence fail, with a potent, flexible and responsive force projection capability.

The Navy/Marine Corps team stands ready today, as in the past, to provide those capabilities. The programs I have detailed for you today are designed to maintain and enhance our capabilities through the remainder of this decade and beyond. Given the traditional support of the Congress, for which the Marine Corps is most appreciative, we will continue to provide this nation those unique capabilities which are the hallmark of our Corps and which have established our position as an integral and essential element of the national maritime strategy.

That concludes my statement. I am prepared to entertain your questions.

STATEMENT OF LT. GEN. JOHN MILLER, DEPUTY CHIEF OF STAFF FOR PLANS, POLICIES AND OPERATIONS, ACCOMPANIED BY LT. GEN. W. J. WHITE, DEPUTY CHIEF OF STAFF FOR AVIATION

General MILLER. Thank you, Mr. Chairman. It is certainly a pleasure and privilege for General White and I to appear before the committee.

I have submitted a statement for the record. I would like to very briefly summarize it and also go into more detail on some of the specific programs which were discussed in the statement for the record.

Senator GOLDWATER. It will be included in the record.

General MILLER. This address is provided with regard to the Marine Corps contribution to the Armed Forces of the United States and our readiness to respond to worldwide programs. The Fleet Marine Forces, as you know, provide the landing forces for

the fleet and, as such, we make major contribution to the seapower of this country, both in terms of sea control and force projection.

The Amphibious Forces provide this Nation a capable, mobile, flexible, and ready force. In other words, we can do a wide variety of things in a wide variety of places and we can do it now.

The improvements which we are going to discuss today in the fiscal year 1983 program are a continuation of the improvements which were initiated in the 1981 supplemental and the 1982 budget.

Today, I will highlight our programs in three areas: maneuver, fire power, and command and control. We will be talking about a portion of the Department of Navy budget, what we sometimes refer to as "green dollars" for the most part. I will discuss the ground programs and General White will discuss the aviation-related programs.

On the modern battlefield maneuver equates to mobility. Our mobility programs are designed not only to maneuver Marines on the battlefield but protect them and improve their firepower. Principal among the programs which we would like to discuss today are the light armored vehicle, or LAV program; the improvements to our amphibious assault vehicles, or LVT's, and the high mobility multipurpose wheeled vehicle, or HMMWV.

Each of these is designed to be multifunctional and to enhance our capabilities across the board as relates to mobility, firepower and logistics support.

LIGHT ARMORED VEHICLE

The first one I would like to discuss is the LAV. This program is designed to provide a new dimension in our capability to engage and destroy highly mobile adversaries. It is lightweight, agile, and helicopter transportable. As you, I believe, are aware, this is a somewhat unique program in that we have selected off-the-shelf vehicles. They are currently undergoing tests. We have selected four vehicles, as you see here. [Chart deteled]. The one on your left is the General Motors of Canada candidate, an eight-wheel vehicle; the two in the middle are both candidates from Cadillac-Gage, one six-wheel and one four-wheel vehicle, and the one on the right is a British Alvis of England, vehicle.

Senator GOLDWATER. Are those guns all the same caliber?

General MILLER. These, I believe, are all 90mm low-pressure guns. These are the assault gun versions of the vehicle. We also have a light assault version of each of these; and in each of the vehicles we are placing a 25mm chain gun, Hughes chain gun, during our tests.

Senator GOLDWATER. How many are in the crew?

General MILLER. Three. We have four of each of these candidates. We are subjecting them to extensive tests. I should say this is a joint program with the Army. We have the program manager, we also have the test director but it is joint in all respects and run under the direction of TACOM.

This next viewgraph [chart deleted] will show you our funding profile for this vehicle as it currently exists. We plan on procuring 744 of these. They will be organized into three battalions of 145 ve-

hicles each in each of the three Marine divisions. the rest of the vehicles, of course, are for the maintenance float general support, and pre-positioned war reserve equipment.

The funding figures I would have to characterize, as you would understand, as soft at this time.

Senator GOLDWATER. Have you talked to the Department of Defense about making a quantity buy of these instead of just so many each year?

General MILLER. I am not sure that we have explored that in its entirety. I think it would be maybe a little premature right now on the basis that we are still in the process of selecting the vehicle. We do not know which of those companies is going to be awarded the contract.

We will award a contract later this fiscal year, though, for the first vehicle to be delivered during fiscal year 1983 with an IOC of at least the first company in late fiscal year 1983.

Senator GOLDWATER. All right.

General MILLER. It may be a little premature until we get further down the road as to a quantity buy. These numbers represent only the Marine Corps' portion of the buy.

AMPHIBIOUS ASSAULT VEHICLE

The next program I would like to address is the amphibious assault vehicle or the LVT. We are doing two things in this program. We are extending the life of our current LVT and we are providing for new procurement to meet our maritime pre-positioning ship brigade program.

The improvements include a new engine and a new power train, new suspension, and better subsystems and other components throughout the vehicle. This is our "workhorse" of the Marine Corps, our amphibious assault vehicle, ship-to-shore amphibious assault by troops, and it is also an armored personnel carrier when it is ashore to be used with mechanized task forces to provide mobility around the battlefield.

Senator GOLDWATER. How many personnel can it carry?

General MILLER. About 24.

Senator GOLDWATER. What is the propulsion, tread?

General MILLER. In the water it is a water jet, and of course on ground it is tread.

Senator GOLDWATER. What is the gun caliber?

General MILLER. The gun in this one is .50 caliber.

Senator GOLDWATER. What speed can you get with that in the water?

General MILLER. In the water, 8 knots, it is advertised, and it will do about that. On land it is a pretty agile vehicle, getting up to around 40 miles per hour.

Senator GOLDWATER. How long have you had this?

General MILLER. We have had LVT's since World War II. We have gone through a number of families. This particular one, the LVT-E7 was introduced in the early 1970's. As I indicated, our entire inventory will be going through a service life extension program [SLEP] during these next 2 or 3 years. We will be buying additional vehicles to bring us up to our acquisition objective.

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Senator GOLDWATER. All right.

General MILLER. This next viewgraph [chart deleted] gives you an idea of the funding profile and I have indicated in the quantity there a "to be determined" because we are just in the process of finishing negotiations with FMC with regard to the first contract which calls for the SLEP, or service life extension of a number of vehicles and the production of only a couple.

There will be a second contract initiated with fiscal year 1983 funds as a follow-on to that. So, we are really not in a position to say—I am not in a position to say—the numbers that these dollars will buy until we have finished these negotiations.

HIGH MOBILITY MULTIPURPOSE WHEELED VEHICLE

The next program that I would like to mention is the so-called HMMWV, high mobility multipurpose wheeled vehicle which will serve as a weapons carrier, communications vehicle, and a logistics support vehicle.

This also is a joint program with the Army. The vehicle will streamline our maintenance and training effort because it is going to replace eight other types of vehicles which are currently in our inventory. Also, the introduction of this vehicle will reduce the total number of motor transport vehicles in our inventory by a substantial margin, about a 40-percent reduction, I believe, overall of that type of vehicle.

There are three candidates that are currently being evaluated by the Army and the Marine Corps. I happen to have a picture here of a Chrysler version. [Chart deleted.] We anticipate going into a production contract on this later this year.

Senator GOLDWATER. Is Jeep one of your suppliers?

General MILLER. I do not believe so, AM General is.

Senator GOLDWATER. AM General is.

General MILLER. This gives the funding profile, indicating this particular budget will be the initiation of five and this only indicates the Marine Corps buying these vehicles. The Army will of course be buying substantially more than we will.

We are very anxious to get this vehicle because our current fleet of the M-151, so-called Jeeps, are wearing out in service. They are also not a good carrier for such things as the TOW weapon system and we think that this vehicle will provide us better mobility and also will provide us the opportunity of affording the crew at least some minimal protection from fragments and small arms.

Senator GOLDWATER. What is the horsepower?

General MILLER. I do not know, sir, I will have to submit that for the record.

Senator GOLDWATER. Will you supply that?

General MILLER. Yes, sir.

[The information follows:]

HMMWV HORSEPOWER

The prototype vehicles of the three competitors have different engines. However, all three have diesel engines in the 160 to 170 horsepower range.

Senator GOLDWATER. Will this take the place of the Jeep that you have?

General MILLER. Yes, sir. This is a five-quarter ton truck. So, it takes the place of all of the vehicles in that category from the five-quarter ton on down, the one ton, three-quarter ton, and quarter ton. It will also replace the trailer that goes with the Jeep.

From our standpoint as amphibious folks, we will save space in amphibious shipping by going to this vehicle because we will eliminate some of the vehicles that we now have to carry.

Senator GOLDWATER. Four-wheel drive?

General MILLER. Yes, sir.

Senator GOLDWATER. All right.

General MILLER. I would like to talk a little bit now about firepower. We have embarked on a program in the Marine Corps which I call "evolutionary" in nature to enhance the total firepower of the Marine division.

Senator GOLDWATER. What is that?

GRENADE LAUNCHER

General MILLER. This is an MK-19 40mm grenade launcher, which is being introduced this year into our forces. That is not a new weapon. It is a weapon that was used by the Navy in Vietnam.

Senator GOLDWATER. That is 40mm?

General MILLER. Yes, sir.

Senator GOLDWATER. It has an unusual shell that has a ball at the end?

General MILLER. Yes, sir; it is a 40mm size cartridge. The new ammunition gives it a substantial penetration against armor. In other words, it will do a pretty good job against the BMP out to ranges of about 2,000 meters. It is also a good area weapon or anti-personnel, antimaterial weapon. We are going to have 12 of these in each of our infantry battalions.

Senator GOLDWATER. Let me ask you a question about that. What is the rate of fire?

General MILLER. It is 360 rounds per minute, I am told.

Senator GOLDWATER. Now, you have a ball on the end of it, but the cartridge looks to be smaller diameter than the ball. Is that right?

General MILLER. No, sir.

Senator GOLDWATER. It sure looks like it.

General MILLER. I think that is the fact that the end of it, the business end there, is a light color.

Senator GOLDWATER. Is the barrel rifled?

General MILLER. Yes, sir; I believe it is. I will have to check that to make sure.

[The information follows:]

THE MK-19 BARREL

The barrel of the MK-19 is rifled.

Senator GOLDWATER. And it is armor-piercing?

General MILLER. It has an armor-piercing capability, certainly adequate to take on light armored vehicles.

Senator GOLDWATER. Is it basically used against armor, or does it have other targets?

General MILLER. I would use it against virtually any target other than very heavy armor because it is very good against personnel in the open, against emplacements, and against other material targets.

It is not a real accurate weapon. In other words, you are not going to get pinpoint accuracy at 2,000 meters; but by shooting rapidly, some 300 rounds per minute, you are going to cover an area and get hits on just about whatever you are shooting at.

Senator GOLDWATER. Do you know the muzzle velocity off hand?

General MILLER. No, sir, but I will provide that. It is a low muzzle velocity. It has a relatively high projectory, and that is why we do not have the accuracy.

Senator GOLDWATER. Is it up to 1,000 feet?

General MILLER. I would say under 1,000 feet per second.

Senator GOLDWATER. 800 hundred?

General MILLER. Let me check that and put in the record. General White has a comment.

[The information follows:]

MK-19 MUZZLE VELOCITY

The muzzle velocity of the MK-19 is 790 feet per second.

General WHITE. Mr. Chairman, I might point out that I have fired this weapon from the door of a helicopter, at the 29 Palms Marine base, from the standpoint of looking at this weapon system for use on our transport helicopters as a fire suppression weapon. I was very much impressed with it. It has good reliability, a relatively high rate of fire, and those 40-millimeter cartridges you see do explode. I could see very easily where this would have a tremendous effect on the enemy, particularly troops that were trying to interfere with our helicopter operations.

We have stated the requirement to equip some of our helicopters with this weapon.

AMMUNITION

Senator GOLDWATER. Do you have anti-personnel ammunition as well as armor-piercing?

General WHITE. There are, I think, two basic types now, the general purpose round and an anti-armor round that is configured differently, of course.

Senator GOLDWATER. Is the automatic feature recoil operated or gas operated?

General MILLER. I will have to check. I would say that it is gas.

Senator GOLDWATER. Gas.

General MILLER. Let me check on that.

THE AUTOMATIC FEATURE OF THE MK-19

The MK-19 is recoil operated.

Senator GOLDWATER. Wouldn't it almost have to be gas operated for helicopter use to get away from the recoil?

General WHITE. That is correct. We need soft mounts for all of our weapons in helicopters and that is a very big consideration, the amount of vibration this would impart to the relatively thin and fragile skin of the helicopter structure.

Senator GOLDWATER. It is a strange looking thing. I would like to see that fired sometime. If you are shooting it around here some place, let me know.

General MILLER. We sure will. I am every excited about this particular weapon as part of this increased firepower for our Marine division.

As I was saying earlier, this is an evolutionary-type of program that we have embarked on. We are going to, in the infantry battalion, of which we have nine in each division, be reducing the personnel by about 10 percent by some reorganization of that battalion; but the introduction of weapons such as this, as well as the other weapons that we are going to introduce, will increase the firepower 25 percent over the current battalion.

M-16 RIFLES

Along with this particular MK-19 we are also, of course, upgrading our M-16 rifles, are buying new improved rifles. We are buying some modification kits for the best of our old rifles so we will have a complete new set of M-16 rifles.

We are buying a squad automatic weapon of which there will be two in each Marine rifle squad. This shoots the same round as the M-16 and will increase the firepower within the squad.

We will be buying additional 50-caliber machineguns, eight per infantry battalion. We have already bought the lightweight company mortar which roughly doubles the range of our current 60-millimeter mortar, and increase the lethality.

We are going to be, in essence, doubling the numbers of TOW weapons in our infantry division and we will increase the number of Dragons, which is the smaller and portable antimechanized weapon.

MK-19

Let me go on through and show you now the funding profile on the MK-19. As you can see, we are starting the procurement this fiscal year, in fiscal year 1982, and will be completing it next year. So, this is a rather near-term improvement to our firepower. Incidentally, this weapon can be ground mounted, as you saw previously, or it can be vehicular mounted on the HMMWV vehicle which we discussed a littler earlier.

Senator GOLDWATER. Who manufacturers that?

General MILLER. The Naval Ordnance Plant in Louisville, Ky.

Senator GOLDWATER. All right.

General MILLER. This is a picture [chart deleted] of the TOW weapon system. We will be buying, as I mentioned earlier, additional TOWs, in essence doubling the number in the Marine division because we will be placing a platoon of TOW's, some 24 TOW's, in each of our infantry regiments.

TOW-II

Also, we are going with the TOW-II which is the improved TOW, a larger warhead, more penetration, it extends the range to 3,750 meters.

The next viewgraph [chart deleted] gives you an idea of the funding profile that we have for the TOW. This is a program we have already commenced.

COMMAND AND CONTROL

There are two programs in the command and control area that I wanted to discuss with you, the position locating reporting system which is sometimes referred to as PLRS, and then also the Marine integrated fire and air support system referred to as MIFASS, which is still in research and development.

These systems, in essence, integrate and provide some real time control and coordination between our infantry units and those units which are providing the fire support. We feel that by utilization of the PLRS which is depicted here as a man packed version, the commander can know on a real-time basis where all of his units are on the battlefield. That includes aircraft that are traversing the battlefield, tanks, infantry units, whoever is equipped with one of these man pack or vehicle units will be reported and can be seen on the screen as to his specific location in three dimensions. That location is accurate to some 10 to 30 meters.

Senator GOLDWATER. What was the accuracy?

General MILLER. Ten to thirty meters on the ground.

Senator GOLDWATER. Do you know how much the back pack weighs?

General MILLER. The back pack weighs in the neighborhood of 20 pounds.

Senator GOLDWATER. Twenty pounds. And the hand computer gives them the information.

General MILLER. Yes, sir. He has a hand computer which can query the system as to his location. He is also capable of limited message traffic utilizing the system. So, it is to a degree a communication device as well as a position locating and reporting system.

You could visualize how a commander, specifically the person that is coordinating the supporting fire, knowing specifically where all of his units are and where his aircraft and so on are, could much more adequately, timely, accurately, and effectively coordinate supporting arms such as; close air support, artillery, mortars, and so on.

Senator GOLDWATER. Who is making this weapon?

General MILLER. Hughes Aircraft.

Senator GOLDWATER. I have seen the Magnovox tested down there at the Marine air base near Yuma. It is a real avancement if they do not get out of line on price.

General MILLER. I think what you saw was a digital communication terminal, was it?

Senator GOLDWATER. No, this was the personnel locator. I was amazed at the accuracy. With this one of course, in walking, the distance was very accurate, the direction was very accurate. Then the location was, I think, on this particular demonstration, around 10 feet.

General MILLER. We are advertising 10 to 30 meters, which is certainly close enough for the battlefield.

Senator GOLDWATER. That is close enough.

General MILLER. This chart shows [chart deleted] the funding profile for this system. I would emphasize again that this is a joint Army-Marine Corps program. This only shows the Marine corps part of the program. The quantity buy indicates a system for each infantry regiment.

Senator GOLDWATER. Go right ahead.

General MILLER. Then we would have one system as a backup training and support system. So, 10 systems total.

Senator GOLDWATER. Have you tried this in the field yet?

General MILLER. Yes, sir, it has just recently completed both its development test and operational test. I saw it out in operation at Camp LeJeune several months ago. It is extremely impressive to be able to sit there and look at the scope and follow helicopters traversing the battlefield, follow people that are in tactical vehicles, follow people landing in LVT's coming off the ships and coming right onto the beach. You can follow them right on in. It is real-time, updated on the second, so to speak.

Senator GOLDWATER. How do the troops like it?

General MILLER. The troops like it. Those who are troop leaders like it because it eliminates some of those errors that we have all been prone to when you are out with an infantry unit, trying to determine just exactly where you are.

Senator GOLDWATER. Fine.

INTEGRATED FIRE AND AIR SUPPORT SYSTEM

General MILLER. Accompanying this and a little later on is the Marine integrated fire and air support system. This just shows [chart deleted] you the control unit. This will take the information from the PLRS system, the position-locating part. It also has its own computer so that it can do the fire planning and the computation of the fire direction orders for the various supporting arms, and integrate all of those into a package and thereby provide timely, accurate, lethal, supporting arms support to the infantry commander.

This is in research and development and the next chart shows you the funding profile. You can see it will be in research and development through the next couple of years. We are looking for an IOC of about 1987 on this system.

Senator GOLDWATER. Can you direct aircraft or helicopters for fire purposes with this sytem?

General MILLER. Yes, sir, that is a part of it. This replaces what we call our direct Air Support Center and our Fast Fire Support Coordination Center in the infantry units from the division on down to the regiment and battalion.

Senator GOLDWATER. This system does not require satellites, does it?

General MILLER. No, sir.

Senator GOLDWATER. I saw a system being tested down there for aircraft direction and they depend essentially on about 12 satellites.

General MILLER. I think that the MIFASS certainly does not require satellites. The PLRS system has one feature, though, that does require satellites or some kind of a surveying system like the

global positioning system. This is, you have to survey the master unit in the PLRS. As long as that one unit knows where he is, then everybody else is relative to that one unit.

So, you have to get a good location on the master unit. If you accurately locate one point on the ground in a regimental area, then the PLRS system works from there.

Senator GOLDWATER. All right.

INDIVIDUAL MARINE

General MILLER. Sir, this completes the systems that I wanted to talk to you about. I think I would be a little bit remiss though, if I did not, before I turn this over to General White, say at least a little bit about the one system in our tactical equation that I think transcends all others in the Marine Corps, and that is the individual Marine.

Our ability to exercise the unique capabilities of the Marine Corps has always been dependent upon our Marines. I am very pleased and proud to report to you today that the Marines we have in the Marine Corps are as good or better than their predecessors. We have been very pleased with the quality that we have been getting, it has resulted in the capability of maintaining a high standard.

We have fewer disciplinary problems than we have had in the past, lower attrition, and steadily improving retention. All of this leads to increased capability. It also leads to personal stability and it has afforded us the opportunity to come up with some modest increases in our end-strength. By utilizing those increases and the increased stability, we have been able to flesh out some of our combat service support units which have been undermanned in the past. This has given us increased sustainability on the battlefield, if you will.

Also, in that same regard, with the programs—the 1981 supplemental, 1982 and 1983 program—we will continue to make great strides in resolving our Pre-positioned War Reserve and mission stocks, and those other parts and material deficiencies which are very key to our sustainability.

With that, sir, I would like to ask General White to go over the aviation-related program.

Senator GOLDWATER. General White?

MARINE AVIATION-RELATED PROGRAM

General WHITE. Mr. Chairman, it is a privilege to again appear before this committee to discuss what we call the "Marine Aviation Green Dollar" program.

RADAR SYSTEMS

I will be discussing four major systems with you in the area of air defense, radar, and missiles. I will start first in the sequence with the radar because that is what is going to find the enemy for us, and then talk about our air control program, and then finally talk about the missiles that will actually engage the enemy. I will be leaving out our fighters in this discussion.

Before I start, I have brought with me the experts in each one of these areas. I would like to introduce them to you. I brought Lt. Col. Bob Molyneux, who is the head of our Ground Air Defense and Control Branch of Headquarters, Marine Corps; Lt. Col. Jay Bierman who is an expert on TAOC-85, and our radars; and Major Joe Della-Corte who is our missile expert.

GROUND AIR DEFENSE

In the area of ground air defense we think we are making significant strides in the Marine Corps. The eyes of our system will be enhanced by the addition of the TPS-59 radar which will come into service in 1984, and you see the TPS-59 on the screen. It is an honest [deleted] three-dimensional surveillance radar and it is manufactured by General Electric. Because of its superior ECM capabilities, ever mindful of what the Soviets are going to throw at us, its improved reliability and maintainability, and overall excellent performance, the TPS-59 is recognized as the world's finest air defense radar. I did not say "free world," I said the world's finest radar.

In recognition of this, the U.S. Air Force, the Government of Egypt, the Israelis, Great Britain, and Belgium have all procured or are in the process of procuring various versions of this radar. Ours is somewhat specialized because of the expeditionary nature of Marine air control units. We have to pack this radar up and ship it out and it has been so configured to facilitate that.

I also think that it is significant to note that the Belgian version, which we probably have more operating experience with, is showing some very remarkable reliability and maintainability figures. For example, 2,000 hours mean time between failure versus the specification of a thousand. So, we are doing better on a two-to-one basis as far as reliability and maintainability.

The next viewgraph [chart deleted] I would like to show is the cost data, the funding data, and also the quantities on this radar, and of course it is in the same format as the viewgraphs used by General John Miller.

Senator GOLDWATER. What is the power requirement of that? That must take quite a bit of power since it all has to be mobile.

General WHITE. Expeditionary generators are used.

Senator GOLDWATER. How many kilowatts of electricity does it take?

Colonel BIERMAN. It requires 89 kilowatts of electricity. The power unit of the radar itself is solid state. There is a different way of calculating it, but it is 21 kilowatt peak power over an 18-percent duty cycle. That is a lot of energy.

Senator GOLDWATER. That is not too easily mobile, is it?

Colonel BIERMAN. Yes, sir, it is more mobile than any radar in the field. We can put it in position and have it on the air in less than an hour. It breaks down mechanically for transportation on two flatbeds. So, it was built for mobility that we had a lot of trouble with in the past.

General WHITE. Mr. Chairman, I might add that since World War II the Marine Corps has specialized in expeditionary air control units. Given the nature of an amphibious operation, the need

to save space aboard ship and then displace that air control equipment ashore as expeditiously as possible and get it on the air to start coordinating air activities, has driven the Marine Corps into looking very closely at expeditionary air control units; and our radar and control squadrons are all configured for rapid deployment, rapid set-up.

Senator GOLDWATER. Eighty-nine kilowatts, how many tons is that?

General WHITE. We will supply that for the record, Mr. Chairman.

[The information follows:]

The TPS-59 is powered by two PU 711/G generators. Each generator weighs 3,600 pounds, or approximately 3.5 tons for the two.

Senator GOLDWATER. That is a great deal of power. You need it for something that big. How many generators do you need for that?

General WHITE. We have two 45 kilowatt generators to back up this system.

Senator GOLDWATER. All right.

General WHITE. You see the ten sets requested in fiscal year 1983 will be employed by our Marine air control squadrons, we call them MACS for short. With their present equipment this will fit in with what we plan to procure in the future.

Now, we think that this program is well managed by General Electric. Can I have the next viewgraph [chart deleted], please?

TACTICAL AIR OPERATIONS CENTER-85

Mr. Chairman, what you are seeing on the viewgraph is called a Tactical Air Operations Center 85—we call it a TAOC-85 for short. The 85 refers to the year in which we plan to have its IOC. The TAOC-85 is the brains of a ground air defense system. It is a modular, state-of-the-art, ground air defense system being produced by Litton Data Systems Division. TAOC-85 provides the facilities for the control of fighters and missiles, a coordination of our fighters and missiles in any kind of antiair warfare environment. It also provides for our aircraft en route traffic control.

It replaces three of our current systems. I might add, the present TAOC is a child of the late 1950's, early 1960's technology, it is worn out in service. Some of the companies that made the parts are no longer in business, so we are having extreme difficulty with spare parts for our present TAOC.

As a result, TAOC-85 reduces the lift requirements by a factor of four to one. Where you had 20 operating huts—as you see on this viewgraph—we are now looking at five to do the same job. That is very important to us from the standpoint of strategic lift, be it air lift or be it sea lift.

Senator GOLDWATER. Let me ask you, you have two vertical radars for intercept purpose, and it seems that you have two rotating. Are those rotating beacons in between?

Colonel MOLYNEUX. Sir, they are all surveillance radars. The TAOC-85 can receive inputs from these radars. It provides redundancy in the event of casualties to the system. Two of them are normally long-range radars up to 250 to 300 miles, and the other

ones the short-range radars with moving target indicators. These short-range radars can be sent out as early warning sites.

Senator GOLDWATER. But those two in the center are rotating antennas?

Colonel MOLYNEUX. Yes, sir, they are all rotating.

Senator GOLDWATER. Well, the verticals are not rotating, are they?

Colonel MOLYNEUX. Yes, sir.

Senator GOLDWATER. They rotate, too? All right, now, how many men do you have in each of those mobile units?

Colonel MOLYNEUX. There would be four operators for each one of those shelters. The functions they would perform would be any function that would be generic to the MACS squadron.

We have a unique situation with TAOC-85 in that these operation modules are self-contained. You can perform all the functions that you need to. This thing gives us a building block capability based on the requirements, the operational requirements. We can build our capability ashore as the situation grows, as the tactical situation requires, increased capability.

General WHITE. Mr. Chairman, there is a savings in technicians and high-skilled personnel by the state-of-the-art nature of the TAOC-85.

Colonel BIERMAN. Our savings will be approximately 80 percent. We have come to realize that with this generation of equipment we cannot obtain the numbers of technicians that we need to maintain this in the field. So, our thrust has been to make it even more reliable and we will be able to reduce the high technical requirements that we were getting into with this. So, we are actually reducing the numbers of technicians that would be required in the field with the TAOC-85.

Senator GOLDWATER. I imagine that equipment is all amphibious?

General WHITE. That is correct. Those are standard-size boxes and all of our loading data or amphibious data has been used in the construction. Yes, that is the first order of business when the Marine Corps looks at a requirement for new air control equipment, can we use it in amphibious operations.

Senator GOLDWATER. How long would it take to set the unit up in the field?

Lieutenant Colonel MOLYNEUX. Our present system takes something in the area of 24 hours to cable the entire system up. Once we get the TAOC-85 module in position, we think we will be able to put it in the air within an hour.

The radar, unlike our present system, does not have to be located with the system itself, it could be located on high ground where you will get the best surveillance. We could radio the information back to the TAOC-85. We have self-contained radios, we require only the external generators with the TAOC-85 module.

So, once we put it in position it is a matter of turning on the radio and contacting the radar module to get the surveillance information.

General WHITE. If I may continue on. TAOC-85 is interoperable with the United States and foreign air defense systems. We designed it as such, and its IOC of 1985 insures the Marine Corps will

have a modern, deployable, air control capability for the battlefields of the 1980's and beyond. I would like to show you the the funding profile.

The contractor, is, of course, Litton, and we have a favorable contract with Litton in this regard in terms of cost-sharing ratios and a cap which provides incentives to the contractor for efficiency.

Incidentally, the U.S. Air Force is also interested in this program as a possible answer to their mobile control element requirement, their CRC's and CRP's, combat reporting centers and combat reporting posts. They have completed a feasibility study in this regard and invested, I think, about $600,000 in looking at this system.

Senator GOLDWATER. I think the Air Force is interested in this system.

General WHITE. They are, sir, very definitely.

Senator GOLDWATER. Can you break that down to a unit cost?

Colonel BIERMAN. $4 million in production, it is between $4 to $5 million unit cost in production. We are buying six of the R. & D. engineering development models at the present time, which will be tested of course and then go into full-scale production. We expect the cost to come down a little bit if the Air Force ends up buying in quantity.

Senator GOLDWATER. Thank you.

MISSILES

General WHITE. I would like to move on to a discussion of our missiles, which is the weapon we use from the ground to attack enemy aircraft. I might start off by saying that our missiles are managed for us by the U.S Army and done in my opinion in a very efficient way.

LIGHT ANTIAIRCRAFT MISSILE BATTALIONS

Just for background I might point out that we have in the Marine Corps three light anti-aircraft missile battalions, LAAM battalions; two are regular and one is Reserve. To give you some scale for proportionality, I believe that U.S. Army operates 22 battalions.

IMPROVED HAWK BATTERIES

We are expanding our surface-to-air missile capability by adding a third firing section to each one of our IHAWK, improved Hawk, batteries in fiscal year 1983. This will increase each battery's simultaneous engagement capability from two to three targets. That is important because we anticipate the Soviets with their predominance of air will try and saturate our air defenses.

We will add an additional Triad battery to each of our light antiaircraft missile battalions, our LAAM battalions in fiscal year 1984. This will result in a 100-percent increase in the battalions' simultaneous engagement capability over what we can do now. This is done for a relatively small increase in personnel and equipment.

Could I have the viewgraph, [chart deleted] that shows the funding? What we are striving for with the IHAWK is increased sustainability and that is what the funding profile is aimed at. We are looking at an inventory objective of 74 percent. When you read the figure 3,188, that represents 74 percent of our inventory objective.

Senator GOLDWATER. That figure, complete, is that after the 1984 buy?

General WHITE. That is correct, after the 1984 buy. We still have in the out[illegible]ars more buys to achieve that figure.

To continue on with the improved Hawk. Thanks to a very recent decision by the U.S Army, the IHAWK system will be with us and in the U.S. Army well into the 1990's. Therefore, we believe that these IHAWK initiatives represent a prudent, economical improvement.

STINGER MISSILE

Now I would like to go to our last program, which is the Stinger missile which is shown on the viewgraph [chart deleted]. In this fiscal year, 1982, we are increasing our forward area air defense platoons—we call them FAAD platoons—from one to four per wing. We have three regular aircraft wings roughly equivalent to a numbered Air Force, and we are adding three of these platoons to each one of the wings for a total of nine platoons. So, we are making a dramatic increase in the capability of this close-in point defense weapon which we have considerable faith in as a very good weapon.

In fiscal year 1984 we will complete the FAAD expansion by adding a fifth platoon to each wing. So, we will have a total of 5 platoons in each one of our wings, a total of 15, and we already have 5 Reserve platoons. So, we will have a total of 20 FAAD platoons available to us in the Marine Corps.

The Stinger, which you are looking at, will provide a head-on all aspect capability and a MARK XII IFF identification feature. That is what makes it such a vast improvement over the current Redeye.

I might add that in January our 3d Marine Aircraft Wing, at El Toro, has equipped its first operational platoon with the new Stinger. We have taken that platoon and made it part of our 7th Marine Amphibious Brigade, which is part of the Rapid Deployment Force.

Could I have the funding, [chart deleted] please? As far as the Stinger is concerned, we are looking at an [deleted] and that is where the figure 12,375 comes from.

Senator GOLDWATER. What is the cost of that?

Major DELLA-CORTE. The cost is approximately $76,000. That also includes some of the ground support equipment, and the cost also varies by the quantities bought, or is tied to the U.S. Army procurement.

General WHITE. That is an important point to note, that since the U.S. Army manages both the IHAWK and the Stinger missile, we take advantage of the Army's much larger buys and join in with them and take advantage of the economics of scale.

Senator CANNON. How is that Stinger upgraded from the old Redeye?

General WHITE. Well, the old Redeye was a system that looks very much like this, but you have to have the aircraft going away and had to have the heat source pretty well established. So, you are shooting going away with the old Redeye. With this one you can take the target head-on, which is a distinct advantage. My thought was when it is going away it has already done its damage. With this one you can get the enemy aircraft before it has a chance to attack you.

And, of course, the IFF feature on this will considerably enhance our ability to control and coordinate, and identify who is friendly in a split second, and who is enemy.

Senator CANNON. Does your fiscal year 1983 request include any funds for the Stinger post missile?

Major DELLA-CORTE. No, sir. The Stinger post will be coming in in our first procurement in 1984.

Senator CANNON. Now, you do not show any R.D.T. & E. funds there. Is there any requirement of funds from you for the R.D.T & E.?

General WHITE. No, sir. I will have to defer to the experts in a moment, but I think all the R. & D. has been taken care of. We are well past that point.

Senator, the majority of the cost, the vast majority of the cost for development of this missile system was borne by the U.S. Army. We may have over the years given them certain small sums, sometimes referred to as "feed money" to show our earnestness in the system, but this is one of the advantages of dealing with a larger service that the Marine Corps could take advantage of.

Mr. Chairman, that completes my portion of the presentation. I will be happy to answer any additional questions.

Senator GOLDWATER. I have a few questions, General. Last year, you know, we put money into the PLRS and the House deleted it, saying it was not cost effective. And they also said that the Army and the Marine Corps should seriously reconsider the cost effectiveness of the PLRS in light of the most recent cost increases, and the potential for GPS to satisfy the requirement.

Now, have you looked at the reasons for the denial given you by the House Armed Services Committee?

General MILLER. Yes, sir, we have. We feel that the noted deficiencies that may have been raised have been answered to our satisfaction.

It is not a competitor to GPS, and GPS will not do the job that PLRS does. As I mentioned earlier, we do need GPS as a complementary system to locate that first master unit. Once that master unit is in, then the rest of the system will function from there.

GPS does not let anybody else know where the people are on the battlefield, it will only let the individual that has the receiver unit know where he is. PLRS is different in that, not only can the individual or unit find out where they are, but the commander also knows where they are on a continuous basis. It is much more extensive in that regard than in GPS.

The House also brought up a question with regard to susceptibility to electronic counter measures, and we have also answered that to our satisfaction. No system that radiates is entirely unsuscepti-

ble, but we feel that this is about as good as you can get in terms of not giving away any additional information to the enemy.

We are very satisfied.

Senator GOLDWATER. Do you feel that you and the Army can argue cost effectiveness this year?

General MILLER. Yes, sir.

Senator GOLDWATER. And you feel the system is well worth it?

General MILLER. Yes, sir, very definitely from the standpoint of being able to provide a degree of command and control that we have never been able to achieve before, reduce the communications on the battlefield, and increase the fire support effectiveness of all of our weapons.

AH–1T—HELLFIRE EQUIPPED COBRA

Senator GOLDWATER. General, unlike the Marines, the Army has chosen not to put the Hellfire missile on their Cobras. Will you describe for us the capabilities and performance of your AH–1T Hellfire-equipped Cobras, and also what night-fighting capability it will have?

General WHITE. The AH–1T Cobra, built by Bell, is of course part of the Marine Corps inventory, and these are our plans for the AH–1T. First of all, we are going through a mod—aircraft modification—in Amarillo, Tex., to equip all of our AH–1T's with the TOW missile.

The TOW missile, of course, is a wire-guided missile and in our estimation it is a good missile, but you also make the firing aircraft vulnerable to being shot down by the target he is shooting at because there is a delay because the Cobra has to stay in a relatively stationary position as it guides the missile toward the tank or whatever target it is firing at.

The aircraft is plainly visible to the enemy. The enemy, of course, is going to react, and so you have a "high noon" situation where the one that is fastest on the draw is going to win.

We think survival rates of our helicopters will come into question. But nevertheless, the TOW missile on our helicopters is the best we have right now. At the same time, the Army has done a very fine job, in my estimation, in developing a Hellfire missile, a relatively small missile with great lethality, and considerable stand-off range. But the beauty of the Hellfire missile is that you can fire the Hellfire missile in a few seconds; acquire the target, launch a missile, and you take evasive action to get out of the range of enemy fire, mask yourself with terrain features from the enemy.

The Marine Corps has been concerned for some time with the buildup of Russian, Soviet armored capabilities. It is very clear to all that if we are going to engage the Soviets or their surrogates that we are going to be confronted with large numbers of armored vehicles thrown at us en masse. So, the Marine Corps has been looking at every possible means to defend itself against the onslaught of Soviet armor. The Hellfire appears to be a very valid system to increase our capability to defend ourselves against the Soviets.

So, we are embarked on putting that Hellfire missile on our AH-1T Cobras. We will have a Cobra that can fire the TOW missile and the Hellfire in the same flight, which will make it a very remarkable and very potent aircraft.

We will take the hard targets with the Hellfire and once we disperse and confuse the enemy, we will move in with the low cost TOW and clean up the battlefield.

SOVIET HIND-D HELICOPTER

We have also, over the last 3 years, looked at the HIND-D helicopter. The Soviets have made a remarkable aircraft out of the HIND-D. It has rocket pods; it has a big gun—I am going to say it is 12.7mm. without knowing for sure [deleted]. It also can carry, at the same time, eight troops.

So, you have in the HIND-D a formidable weapon system. In addition to that, the Soviets have seen fit to produce this aircraft in large numbers. We anticipate in addition to the tank columns that I just described a moment ago, being confronted by large numbers of HIND-D's whose job will be to ride the flanks for the tank columns and clean out our antitank helicopters.

We have to provide a defense against those. So, we have taken steps with the Navy over the last 3 years at China Lake, and other places, to develop the capability to fire a Sidewinder from our Cobra helicopters. We have been successful in a number of tests and we are now going through a modification that will equip our Cobras with the Sidewinder.

It gives me a great deal of confidence that, should we be jumped by the HIND-D or even fixed-wing aircraft against our helicopters, we will have the means of defending ourselves that looks very potent.

Now, you have asked the question about what kind of a night capability we would have with the Cobra. And by the way, the Cobra we are talking about is unlike the Army's Cobra. I might talk about that.

The Cobras we have, the AH-1T, comes in at 14,000 pounds empty weight. The reason we have been able to do that, we have the T-400 twinpack engines on our Cobras. So, we have increased our payload by about 4,000 pounds to accommodate those additional weapon systems.

We have also upgraded the dynamic components, the drive trains to take this increased power. So, they are powerful, they are small but powerful aircraft.

Now, as far as night operations we are taking these Cobras and reconfiguring the cockpit for night vision lighting and are also into second- and third-generation goggles for our pilots. In addition to that, we have also undertaken to equip these aircraft with the FLIR augmented Cobra TOW sight which will give it a capability—although not a very strong capability—to engage targets with the TOW missile at night.

That is where we are going with the Marine Cobras.

Senator GOLDWATER. How much is the AH-1T going to cost?

General WHITE. I do not have the data on the AH-1T. We have been planning now for several years to make a buy in 1984 of 22,

and the following year 1985 of 22, for a total of 44 aircraft. I am unable at this point to give you the cost. I will have to defer that, if I may, for the record.

Senator GOLDWATER. If we can have that as soon as possible because we are going to start writing this bill up, and we have to know.

General WHITE. I will be happy to supply that, sir.

[The information follows:]

AH-1T COST

The fiscal year 1983 budget request contains the following funding profile for the AH-1T.

[Dollars in millions]

	Fiscal year—					
	1983		1984		1985	
	Quantity	Amount	Quantity	Amount	Quantity	Amount
Adv procurement		$17.2		$14.5		
Initial spares				17.9		$15.4
APN-1			22	163.9	22	155.2
Total		17.2	22	196.3	22	170.6

M-60 TANK

Senator GOLDWATER. Now I have a question of General Miller. Are we still planning to replace the M-60's?

General MILLER. Sir, we are currently equipped with the M-60 as you have indicated. We started equipping our force in about 1974 with that tank. It has a 15-year life. So, we are really not pushed at this time to replace the M-60. We are watching the Army's program and we are very interested in it. But I guess I would have to say, we have the luxury of another couple of years prior to making that decision.

Senator GOLDWATER. But you are thinking about that?

General MILLER. Yes, sir.

Senator GOLDWATER. All right, thank you. Howard?

AV8B—GAO REPORT

Senator CANNON. General White, the GAO recently published a report on the AV-8B. The report listed the shortcomings, including maintenance support, trainer aircraft support, cost estimating, aircraft survivability features.

What is your overall assessment of that GAO report?

General WHITE. Senator, I have read that report, I read it last summer. I also looked at our rebuttal to that report and I am disappointed that the GAO authors of the report did not use more of the information we supplied. But that is their prerogative, of course.

The comments about maintenance are rather interesting. I understand that they received that information by turning to our

flight-line personnel at Cherry Point and talking to maintenance NCO's. We readily admit that at the present time in our AV-8A squadrons we do not have all the people and the skills we require.

But that is not to say that in 1986, at the height of the AV-8B standup that we will not have made plans to have those squadrons adequately manned.

As a matter of fact, we have to look at an even earlier date, we are looking at this summer to increase all of our AV-8A squadrons, and we have one training squadron and three operational squadrons, and will increase the maintenance personnel, the staff NCO's, and the pilots to a hundred percent as a start to achieve a building phase toward the beginning of the transition into the AV-8B's. That is prudent management.

Senator CANNON. Is their report correct, then, stating that 30 percent more maintenance personnel would be required to support a 20-aircraft AV-8B squadron and the 325 level planned by the Marine Corps?

General WHITE. I think what they need to do is take a look at the MO factor. When you are dealing with 15 aircraft you have a certain number of people; when you go to 20 aircraft, you need additional people. That, I think, explains the increase in the number of people per squadron.

The AV-8B admittedly is a more sophisticated aircraft and has some specialized systems that the AV-8A lacks, and would require more people. But I think basically you are looking at an increased number of aircraft. Every time you increase the number of aircraft you increase the number of people required to handle that squadron.

Senator CANNON. I understand that. But your estimate, as I understand it, is that for 20 aircraft squadrons you would need 325 people. And they say that 30 percent more maintenance personnel would be required than that. Is that correct or not?

General WHITE. Just by chance I have Col. Jimmy Orr who is the program manager, with me. I think perhaps it would be wise if I call on him to respond to the details of the question, sir.

Colonel ORR. Sir, our direction was to remain within the current personnel structure of the Marine Corps light attack community when we went from five A-4 and three AU-8A squadrons. We are structured to do that and the current number which is still being ground out by the people who compute such numbers for us, is in the 320- to 325-person range for a 20-plane AV-8B squadron. No, sir, we will not be exceeding that number.

Senator CANNON. So, you are just saying that their estimate that you would require 30 percent more maintenance personnel is not correct.

Colonel ORR. We will require something approaching 30 percent more people for 20 plane squadrons than we do for the existing 15 plane squadrons.

Senator CANNON. But I am saying, I think their estimate related to your estimate of the 325 level.

Colonel ORR. Those are not the numbers that we are showing, no, sir.

Senator CANNON. Did you read their report the same way that I am stating it?

Colonel ORR. I read one of their early drafts of the report and this was one of the items with which we took issue, and I thought that it had been ironed out; apparently it was not.

Senator CANNON. Will the Marine Corps need to procure trainer aircraft to train pilots to fly the AV-8B aircraft?

General WHITE. The answer to that, Senator Cannon, is yes. We are going to require 24 two-seat Harriers—we describe them as TAV-8B's.

Senator CANNON. Are they in your procurement program?

General WHITE. They are not at this present time. They are an issue in the fiscal year 1984 budget deliberations we are having with the Navy, and I fully expect to have those in the President's budget this time next year.

I think it is important for me to point out that we have a 336 aircraft, total aircraft, procurement program. It has been the Marine Corps' intention all the way through to pay for those two seaters out of that program. To put it straight-forwardly, we plan to swap single seaters for two seaters.

Senator CANNON. You mean you will reduce your procurement level enough to make up for the cost of the two seaters?

General WHITE. That is correct.

Senator CANNON. How much will those two seaters cost you?

General WHITE. I do not think that the individual cost of that aircraft has been completed computed. We have some preliminary data that has indicated to us that the development cost will be in terms of $160 million.

But I again stress that we are prepared to pay for those aircraft out of our existing single-seat aircraft, and one of the reasons that we have taken that viewpoint is that these two seaters will be TAV-8B's, although we will not buy the systems that will make it a combat aircraft, this aircraft can be used in a combat role.

Senator CANNON. Do you think the GAO is correct in assessing the program cost for the AV-8B will continue to grow?

General WHITE. They are probably correct if we keep on procuring the aircraft in small numbers. Yes, I think we all understand inflation, but the difficulty with our program right now is the small numbers that we are coming over here for. In this year's budget we are down for 18 aircraft. The Marine Corps' view was 24. Totally, over the FYDP years, we have lost 40 aircraft. If each year we come over here having lost 20 or 30 percent of our program, we are going to have a very high-cost aircraft.

We shall call into question the wisdom of continuing on. I have made before other committees the same statement, that we need to continue on with an economical buy of this aircraft, taking advantage of scale, so that we can—as we have done for years—make sure the cost of this program is kept at a reasonable economic rate.

I might also point out—and this may sound like an editorial—that the Marine Corps has been very careful, has been frugal with our approach to the AV-8B program. I think it shows in the way we have managed it. But we cannot combat small numbers. We asked for 24 and only received 18. That is a cost increase beyond the control of the Marine Corps.

Senator CANNON. Well, given the cost increases that have occurred in the program, is the AV-8B still cost-effective?

General WHITE. I would say so. You cannot measure in dollars the capability that the AV-8B VSTOL aircraft will bring to the Marine Corps, it will equip eight light-attack squadrons and will have a remarkable basing ability that the AV-8B will bring to us.

Senator CANNON. I have some other questions I will submit to you, that you can answer for the record. One of them is, I want to see your loss ratio on the AV-8B compared to other aircraft at this point in time, and a few others. I will submit them.

General WHITE. I will be happy to supply that.

AIRCRAFT PROCUREMENT

Mr. Chairman, I have in front of me now some figures for the AH-1T buy, if you would like to have them. In the fiscal year 1983 budget we are requesting $17.2 million in long lead and then the figures I have funding for fiscal year 1984 show in APN, Aircraft Procurement Navy, $196.3 million—that is fiscal year 1984 for the purchase of 22 aircraft. The figures I have for procurement unit cost are in fiscal year 1984 $8.92 million per aircraft. The figures I have computed for 1985 are $7.7 million per aircraft.

Senator GOLDWATER. We have just been notified that we have to be on the floor. I have a few questions here for General Miller, I will ask you to submit the answers for the record; and Senator Cannon has some questions, I think, which will be submitted.

We will ask you to answer them for the record. I want to apologize for not having been able to be here for the whole presentation. I think it has been very well handled, very well presented. Now all we have to do is sit down and sweat it out.

Thank you, gentlemen.

General MILLER. Thank you very much, Mr. Chairman.

[Questions submitted for the hearing record follow:]

QUESTIONS SUBMITTED BY SENATOR BARRY GOLDWATER, ANSWERS SUPPLIED BY GEN. JOHN MILLER, USMC

USMC CHEMICAL CAPABILITY

Senator GOLDWATER. General Miller, how would you characterize the ability of the U.S. Marine Corps to fight in a chemical environment today?

How long could the Marines sustain a chemical protective posture if engaged by Soviet forces employing chemical weapons?

What retaliatory capability would the Marine have at their disposal? Are such weapons integrated into the forward elements and available for immediate use at the discretion of the theater commander? Do you believe that Soviet forces against who Marines may have to fight are in the same position?

What, in your judgment are the implications of having such an imbalance in capabilities?

General MILLER. [Deleted.] As the result of recent initiatives the present Marine Corps program reflects funding to correct deficiencies in both individual protective equipment and detection, warning and detection, warning and decontamination devices. The addition of trained NBC specialists, including officer and enlisted personnel during fiscal year 1982 to the Marine divisions, Marine Aircraft Wings and Force Service Support Groups, will enhance both NBC training and operational effectiveness. [Deleted.]

The Marine Corps could expect to operate effectively for at least [deleted] days if engaged by forces employing chemical weapons in a sustained manner.

We have the capability to employ both artillery and air delivered chemical munitions within the Marine Air Ground Task Force (MAGTF). The employment of chemical munitions is a matter of national policy and, therefore, these munitions are not immediately available for use by the Marine Corps.

On the battlefield we should seek to limit any tactical advantage that use of chemical munitions might bring to our adversaries by implementing protective measures and having the capability to respond in kind swiftly and effectively.

MODERNIZATION OF CHEMICAL WEAPONS

Senator GOLDWATER. General Miller, do the Marines believe that the modernization of our chemical deterrent is an urgent national priority and that introduction of binary chemical weapons will represent an important needed enhancement of a chemical stockpile that is otherwise in danger of becoming useless—and therefore losing its deterrent value?

Would the Marines prefer to have the binary munitions planned for production in their arsenal or would they rather stick with existing unitary weapons?

From a safety, handling, transportation and useability point of view which is more desirable?

General MILLER. The deterrent value of our present chemical munitions stockpile is minimal at best. The safety, effectiveness, and utility of our unitary chemical munitions have decreased significantly over time and there is an urgent national need to modernize this class of weapons in our arsenal. I believe, by far, the best approach to chemical modernization is through the replacement of unitary munitions with more modern weapons. A stockpile of modern binary chemical weapons along with the capability to quickly employ them in retaliation will provide the maximum deterrent to Soviet first-use of chemical weapons.

CHEMICAL WEAPONS

Senator GOLDWATER. General Miller, what does the Marine Corps think of the idea of deterring the use of toxic chemical agents against Marines engaged in landing assaults, embarked at sea, or in combat on the ground or in the air, simply by getting every Marine outfitted with chemical defensive equipment?

Do you believe that the disadvantage at which the Marines would find themselves—if unable to force their adversary to be equally encumbered—may be so attractive an outcome as to encourage the use of chemical weapons against U.S. Marines, rather than deter such use?

General MILLER. The fact that every Marine has a chemical protective suit may not deter the enemy's use of toxic chemical agents. Deterrence involves not only protective means but also effective means of retaliation to insure the enemy will not initiate chemical warfare.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND, ANSWERS SUPPLIED BY GEN. JOHN MILLER, USMC

USMC TASK ORGANIZATION

Senator THURMOND. General Miller, in your statement you mentioned task organization for various missions. Would you outline how the Marine Corps task organizes for different missions?

General MILLER. Fleet Marine Forces will normally be employed as integrated air-ground teams called Marine Air-Ground Task Forces (MAGTF). Three basic types of MAGTFs can be formed:

Marine Amphibious Unit (MAU), organized around an infantry battalion,

Marine Amphibious Brigade (MAB), organized around an infantry regiment, and a

Marine Amphibious Force (MAF), organized around a Marine Division.

Although we maintain some MAGTF Headquarters, the units in a MAGTF are not permanently assigned; they are task organized for a specific mission and, after completion of that mission, returned to their parent command.

This method of employment exploits the combat power inherent in closely integrated air and ground operations.

DESERT WARFARE LESSONS

Senator THURMOND. General Miller, the Marines are to be commended for their performance during Bright Star 82. I know that you train for desert warfare extensively at Twenty Nine Palms, California. From these training experiences and those in Oman, what lessons have the Marines learned about desert warfare that may impact on contingency planning for Southwest Asia?

General MILLER. The Marine Corps enjoys the advantage of having trained in a desert environment at 29 Palms for many years before Southwest Asia (SWA) became a prominent contingency area. Consequently, a good foundation for desert operations already existed in the Marine Corps. For example, we have experienced the heavy demand for water, dust and sand corrosion problems, and the austere environment posed by the desert. [Deleted.] Therefore, our lessons learned from Bright Star are not as extensive as we would hope. Nevertheless, certain problems are apparent as we look to improving the capability to conduct amphibious operations in SWA.

A few of the important lessons from Bright Star 82 include: [Deleted.]

Desert sand is a problem area. Its consistency and trafficability vary from location to location. [Deleted.] The availability of accurate up-to-date charts and maps is also a requirement.

Marine Corps desert training has pointed out many lessons which are common to other geographic locations, but take on a greater significance in the SWA theater because of the extreme distances involved. For example, the early exchange of knowledgeable liaison officers with the host nation is a must. [Deleted.]

The impact of these lessons, and many others not mentioned, on contingency planning is to emphasize that the surest way to prepare Marines to accomplish missions in support of national defense objectives is to continue exercising in as many varied climates and locations as possible.

BRIGHT STAR 82 EQUIPMENT PROBLEMS

Senator THURMOND. Were there any equipment problems that would effect your mission?

General MILLER. [Deleted.] Consequently, the landing force experienced no equipment problems at all.

M-16 RIFLE IN SANDY CONDITIONS

Senator THURMOND. How does the M-16 rifle hold up under sandy conditions.

General MILLER. The M16A1 Rifle holds up well under sandy conditions if proper maintenance and lubrication procedures are followed. The use of a muzzle cover, the practice of retaining a magazine (even if unloaded) in the magazine well and keeping the ejection port cover closed provide a reasonable level of protection to the internal parts of the rifle in sandy conditions.

AH-64 HELICOPTER

Senator THURMOND. General Miller, the Army wants to buy the AH-64 helicopter. Do you feel that his helicopter would be beneficial to the Marine Corps?

General MILLER. Yes, it would. The Marine Corps is most impressed with the night/marginal weather capability of the AH-64 against armor targets.

EMPLOYMENT OF THE AH-64

Senator THURMOND. How would you envision employing this helicopter?

General MILLER. The AH-64 would be employed with each Marine Amphibious Force to provide a night/poor weather attack helicopter capability against armor targets.

MK 19 40MM MACHINE GUN

Senator THURMOND. General Miller, in your statement you mentioned the MK-19 40mm grenade launcher as an anti-armor weapon. What types of Soviet armor can this weapon defeat?

General MILLER. The MK19 40mm Machine Gun with High Explosive-Dual Purpose ammunition is capable of penetrating at least 2½ of rolled homogenous armor and therefore, is effective against lightly armored vehicles such as the BMP, trucks and other materiel targets.

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER, ANSWERS SUPPLIED BY GEN. JOHN MILLER, AND GEN. W. J. WHITE

AV-8B TRAINER

Senator WARNER. Gen. White, I submitted some questions for the record on the TAV-8B during the hearing on Tuesday. However, I desire to pursue it further.

I see your budget includes no provision for a trainer for the AV-8B.

Do you need a trainer?

If so, what is your plan to obtain one?

General WHITE. Yes, as you are aware, the AV-8B is an entirely new aircraft and a vast improvement over the 1950's technology of the AV-8A/TAV-8A.

We currently have 7 TAV-8A's in the inventory. These aircraft simply will not provide adequate training capacity for the AV-8B transition—either in numbers or training capability.

After thorough analysis of our requirements, we have decided to procure a stretched two-seat version of the AV-8B (90 percent plus common with AV-8B) that will provide excellent training as well as have a combat capability.

Our continuing goal to tightly control total cost in the AV-8B program dictates that we use a portion of the budgeted procurement funds for AV-8B to do this. However, this option is available to us only if economical procurement rates are achieved.

AV-8B PRODUCTION

Senator WARNER. Fiscal year 1982 Advance Procurement Funds to support initial production of 24 aircraft planned for fiscal year 1983 were reduced in the October Budget revision to support only 18. This was accepted by the Congress, and 18 aircraft are requested for fiscal year 1983.

The fiscal year 1983 budget now requests substantial amounts of funds to support increased production rates for numerous aircraft and other weapon systems because substantial savings can be realized with more efficient and economical production rates while achieving earlier uprating of our operating forces. Substantial amounts also are requested for a growing number of aircraft which qualify for multi-year procurement.

In view of this new policy, why doesn't your budget request funds for the original requirement of 24 AV-8B's?

General WHITE. The original requirement for 24 AV-8B's in fiscal year 1983 has not been altered.

As I understand it, the production priorities as reflected in the fiscal year 1983 budget resulted from fiscal constraints placed upon the Department of the Navy. However, I would like to defer this question to the Deputy CNO (Air Warfare) for response.

Senator WARNER. I understand that $20 million is needed and has not been budgeted. Would you support a plan which would allow you to start the program now by using the $4 million added in fiscal year 1982 by the Congress for the AV-8B plus, and then either having the Congress add the balance of $15 million for fiscal year 1983, or reprogram this amount from other fiscal year 1983 programs?

General WHITE. It is essential that we start the program now. The Marine Corps will support congressional actions to do so. However, you must remember that the Marine Corps has limited authority to suggest that reprogramming actions could be a solution.

Senator WARNER. Would you support an increase of 6 aircraft if the Congress provided additional funding?

General WHITE. Our immediate goals for the AV-8B program include near term achievement of an economical production rate for this aircraft. I feel that the first step toward this important goal would be to increase the 1983 procurement from 18 to 24.

Senator WARNER. If the Congress did not add the required funding, why shouldn't the funds come from some of the other programs in your budget which have been proposed either for increased production rates or as candidates for multi-year procurement. I expect that not all of these will be approved as requested.

I realize these questions may be above the level of the Marine Corps for response. And if so, request that you forward them to the Secretary of the Navy.

General WHITE. As you are well aware, the Marine Corps does not establish priority for Department of Navy programs. I would like to defer this question to the Deputy CNO (Air Warfare) for response.

Senator WARNER. If required in fiscal year 1982 or fiscal year 1983 to meet your required training program, how do you plan to finance it?

General WHITE. The AV-8B program originally accounted for the TAV-8A trainer requirement within the APN line. Our recent decision to seek a combat capable TAV-8B trainer, instead of a TAV-8A, was based on the expectation of reprogramming fiscal year 1983 APN funds, equivalent to about one aircraft, into R&D to get started, and then to request fiscal year 1984 R&D in that year's budget submit. That course of action would meet our required training date of 1986.

When the fiscal year 1983 AV-8B procurement figure was reduced to 18 aircraft from 24 aircraft, this flexibility disappeared. With the current fiscal year 1983 AV-8B funding we no longer have available a reasonable source for R&D funds within the AV-8B program. That circumstance will delay our start one year, and we will be unable to meet safely the 1986 training requirement.

Senator WARNER. How much would it cost to develop? To produce?

General WHITE. A thorough cost study is currently underway at Naval Air Systems Command, the results will be made available during April 1982. However, based on best information made available to the Marine Corps to date, it is anticipated that the development costs of the 2 seat AV-8B would be approximately $160 million. This same information includes an estimate that the 2 seat version will cost approximately $2 million more per copy than the AV-8B.

Senator WARNER. How many would you need and when would they be needed?

General WHITE. Our requirement is for (24) 2 seat AV-8Bs. This is based on Navy standards for procurement of training aircraft.

It is essential that deliveries of the 2 seater start during fiscal year 1986 to meet our training requirement as we transition from the A-4M to AV-8B for our light attack force.

It is anticipated that 2 aircraft could be delivered during 1986 and that 6 per year thereafter (total 24) would meet our training requirement.

Senator WARNER. When would initial funds for development be required and how much?

General WHITE. I feel sure that, in order to have deliveries during the critical training years of 1986 and subsequent, RDT&E funding in the amount of $20M in fiscal year 1983 would get the 2 seater program off to a solid start.

LAV PROGRAM STATUS

Senator WARNER. What is the current status of the LAV program?

General MILLER. The LAV program is currently in the Test and Evaluation (T&E) phase of the acquisition process. The four candidates (V150 and V300 from Cadillac Gage, MOWAG-PIRANHA from GMC, and Scorpion from Alvis) are being evaluated at Twentynine Palms, California to obtain data to be used in the source selection process. This data will help the Source Selection Authority, Maj. Gen. Decker, TACOM, U.S. Army, identify the best vehicle at an affordable price to satisfy both Army and Marine Corps requirements. A production decision will be made in July 1982 and the subsequent contract award, also in July 1982, will issue the Initial Operational Capability (IOC) of 1983 for our first Light Armored Assault Company.

LAV ARMAMENT

Senator WARNER. What do you anticipate as the vehicle armament?

General MILLER. The basic requirement for the LAV is to enhance the firepower and mobility of our ground combat forces. In an effort to optimize these enhancements we intend to introduce three new essentially self-sufficient battalions which will be capable of performing a variety of missions. The basic LAV within this battalion will be equipped with an M242, 25mm chain gun. It is planned to configure some LAVs as antitank, assault gun, and air defense vehicles.

WHEELS VERSUS TRACKS

Senator WARNER. Is the competition essentially wheels vs. tracks?

General MILLER. The four candidates vehicles currently being tested cover the broad spectrum of lightweight armored vehicle configurations. There are three wheeled competitors (i.e., Cadillac Gage V150 (4×4), Cadillac Gage V300 (6×6) and GM of Canada (8×8) and one tracked competitor (Alvis of England). The test is to determine which of the vehicles, regardless of whether it has wheels or tracks, best meets the stated requirements. It is not intended that the test provide an answer to the "age old" question of whether wheels are better than tracks or vice versa.

QUANTITY OF LAVS

Senator WARNER. What is the quantity anticipated for procurement and has this number changed? If so, why? How will it affect procurement costs per unit?

General MILLER. Our original funding requirements were based upon vehicle costs developed from market surveys of existing vehicles. At the direction of DOD, on 5 June 1981 we signed a Memorandum of Agreement with the Army establishing the LAV program as a joint program, with Tank and Automotive Command managing the program. With this responsibility went the requirement to revalidate the program costs based upon the bids received from industry as a result of the T&E Request for Proposals (RFP). Based upon this new cost data, and in preparation for the fiscal year 1983 Budget submission, a new acquisition profile was developed in December 1981. The cost estimates were extremely high, causing a reduction in the procurement quantity of LAVs from 744 to 503, which was unacceptable. A reevaluation of the data was directed.

In December and January the LAV PM conducted a thorough review of the program funding. Basic vehicle costs were developed parametrically based on similar hardware and components. The results were then compared to prior foreign military sales contracts issued by TACOM, and were found to be comparable and, therefore, acceptable.

We now project that our fiscal year 1982 funds will enable us to buy 60 LAVs configured as Light Assaults with 25mm chain guns. It must be emphasized, however, that all our funding projections are best estimates until the bids are received for the production contract (April 1982).

In testimony to this Committee last year it was projected that beginning with procurement in fiscal year 1982 it would require $481.5M to purchase 742 LAVs. As a result of the detailed program review mentioned above, it has been projected that we can buy 744 LAVs with $468.8M. The following profiles are provided for comparison.

MARCH 10, 1981

	Millions	Quantity
Fiscal year:		
1982	$36.2	72
1983	63.0	108
1984	80.7	128
1985	85.1	128
1986	89.0	128
1987–88	127.5	178
Total	481.5	742

APRIL 27, 1981

	Millions	Quantity
Fiscal year:		
1982	$36.2	60
1983	89.7	134
1984	84.3	141
1985	85.1	116
1986	123.5	229
1987	50.0	64
Total	468.8	744

LAV DESIGN

Senator WARNER. Have there been significant design changes? If so, has the Marine Corps agreed with all the changes?

General MILLER. At the inception of the LAV Program, in March of 1980, we testified that the introduction of light armored vehicles would enhance the tactical fire-

power and mobility of our ground combat forces. In this regard we identified the following four general requirements for the LAV to fulfill: (1) provide a broad base of weapons systems to enhance our fire support, (2) transportable by the CH-53E helicopter, (3) provide the maximum level of protection within the weight constraints, and (4) provide a high degree of mobility and agility on roads and cross-country operations. With these four basic requirements a survey of the existing market of LAVs was conducted. The results of the survey indicated that in order to reduce the potential competitors to a manageable number more definition of our requirements was required. A Required Operational Capability (ROC) was developed which set forth a list of specifications which were largely based upon what had been found to exist in "off-the-shelf" vehicles as a result of the market survey. This initial ROC specified the following fundamental requirements:

Mobility.—minimum top speed of 50 mph and an operating range of 400 miles

Agility.—acceleration of 0–20 mph in 10 seconds and braking from 20–0 mph in 35 feet

Armament.—(1) a variant mounting a gun with the capability of the M242, 25mm chain gun, (2) a variant able to penetrate 300mm of rolled homogeneous armor at 2,000 meters

Crew Size.—all variants would have a driver and a commander with a gunner required on gun variants; one variant would carry an additional six combat equipped Marines; other variants would carry additional personnel as appropriate to the mission

Protection.—capable of stopping 7.62mm ball ammo and 152mm air bursts at 50 feet

RAM-D.—.90 confidence of completing 200 mile mission; .85 operationally ready; less than 1.3 hours mean time to repair at organizational level; and 2,000 miles between overhaul

Throughout the process of developing the LAV acquisition strategy, the specifications have remained constant. The initial ROC was revised in December 1981 primarily to amplify on the capabilities of the other mission variants needed to complete the family of LAVs for the Light Armored Assault Battalion. There has been no significant changes to the fundamental requirements that were in the initial ROC.

LAV UNIT COST

Senator WARNER. What is the anticipated cost per unit, by contractor?

General MILLER. The source selection process is far from complete. The cost proposals submitted by the contractors are considered "competition sensitive" and should not be divulged.

OFF-THE-SHELF LAV

Senator WARNER. This Committee was led to believe two years ago that this type of vehicle could be an off-the-shelf buy. With the length of the testing program it would appear this is not the case. Can we still consider the program "off-the-shelf"?

General MILLER. The Light Armored Vehicle (LAV) program is a "modified off-the-shelf" acquisition effort. When the program was briefed two years ago an ongoing "market survey" was under way. The results of this survey indicated that no single lightweight armored vehicle existed that completely met our requirements. The survey did provide us with a wealth of knowledge concerning "off-the-shelf" components available in existing vehicles. Our strategy has been to identify those "off-the-shelf" components which could logically be incorporated into an existing vehicle and we defined our LAV requirements accordingly. The emphasis has been on the integration of these components and not the development of a new vehicle. The testing of our defined LAV has been extremely compact and designed to evaluate the contractors' integration of the components into their vehicles. It is based upon these aspects that the LAV program is considered a "modified off-the-shelf" acquisition effort.

QUESTIONS SUBMITTED BY SENATOR JOHN WARNER, ANSWERS SUPPLIED BY ADMIRAL MCDONALD

AV-8B PRODUCTION

Senator WARNER. Fiscal year 1982 Advance Procurement Funds to support initial production of 24 aircraft planned for fiscal year 1983 were reduced in the October

Budget revision to support only 18. This was accepted by the Congress, and 18 aircraft are requested for fiscal year 1983. The fiscal year 1983 Budget now requests substantial amounts of funds to support increased production rates for numerous aircraft and other weapons systems because substantial savings can be realized with more efficient and economical production rates while achieving earlier uprating of our operating forces. Substantial amounts also are requested for a growing number of aircraft which qualify for multiyear procurement. In view of this new policy, why doesn't your budget request funds for the original requirement of 24 AV-8BH's?

Admiral McDONALD. The fiscal year 1983 budget represents a balanced procurement plan which is structured to meet force requirements within fiscal constraints. This plan supports each warfare area in a consistant manner, such that no force element is supported at the expense of another and that all are balanced with respect to the maintenance of currently authorized force levels. No fiscal year 1983 procurement program has grown between the fiscal year 1982 and 1983 budget requests, and the AV-8B is but one of several which were reduced to meet fiscal constraints. The requested 18 AV-8B's will allow for the maintenance of the current Marine light attack force structure, albeit in less than an optimum manner. Offsets from other programs to increase an AV-8B procurement would be at the expense of maintaining force structure in other decremented programs, or at the expense of those savings which are expected to accrue from multiyear procurement for which advance funding has been requested.

Senator WARNER. If the Congress did not add the required funding, why shouldn't the funds come from some of the other programs in your budget which have been proposed either for increased production rates or as candidates for multiyear procurement? I expect that not all of these will be approved as requested. I realize these questions may be above the level of the Marine Corps for response. And if so, request that you forward them to the Secretary of the Navy.

Admiral McDONALD. The fiscal year 1983 budget represents a balanced procurement plan which is structured to meet force requirements within fiscal constraints. The AV-8B program has not been decremented at the expense of supporting increased production rates or multiyear procurement. The following table illustrates, that no procurement program has grown between the fiscal year 1982 and fiscal year 1983 budgets, and that the AV-8B is but one several which have been cut back, to meet fiscal constraints.

	Fiscal year—		
	1982 amended budget 1983 request	1983 budget 1983 request	Delta
A-6	12	8	—4
EA-6B	6	6	
AV-8B	24	18	—6
F-14	24	24	
F/A-18	84	84	
CH-53E	14	11	—3
P-3C	12	6	—6
E-2C	6	6	
SH-2F	18	18	
C-2	8	8	
T-34C	60	30	—30
TH-57	21	21	

Offsets from other programs to increase the AV-8B procurement would be at the expense of maintaining force structure in those decremented programs, or at the expense of those savings which are expected to accrue from multiyear procurement for which advance funding has been requested.

QUESTIONS SUBMITTED BY SENATOR HOWARD CANNON, ANSWERS SUPPLIED BY GEN. W. J. WHITE, USMC

AV-8B

Senator CANNON. General White, is the AV-8B Program adequately funded in the fiscal year 1983 budget request?

General WHITE. To the degree that the funding requested in the fiscal year 1983 Budget will procure the 18 AV-8B aircraft requested, the AV-8B program can be said to be adequately funded. I should point out, however, that the funding requested is based on fiscal constraints. The fiscal year 1983 Budget Request does not provide sufficient funds to procure the 24 AV-8Bs which are needed to meet our light attack requirements. Viewed from this perspective, the AV-8B program is not adequately funded in the fiscal year 1983 Budget Request.

AV-8A

Senator CANNON. General White, what is the accident rate that the Marine Corps has experienced with the AV-8B? How does this rate compare with those of other fighter and attack aircraft?

General WHITE. The Marine Corps lifetime class A mishap rate, from 1971 through 1981, of the AV-8A is 33.56 mishaps for every 100,000 flight hours. This rate can be compared with other fighter and attack aircraft in many different ways. The AV-8A is a concept prototype aircraft which represents a significant departure from what has gone before. The total U.S. flying experience in this aircraft amounts to approximately 133,000 hours and 135,000 sorties. Figures 1 and 2 compare the AV-8A with other fighter and attack aircraft at the same aggregate flight hour and sortie points. This comparison reflects the same relative experience level in each type aircraft rather than an attempt to compare aircraft in their maturity with a concept prototype. As can be seen by the charts, the AV-8A compares favorably.

COMPARATIVE CLASS-A MISHAPS VS SORTIES

FIRST 135,000 SORTIES (DERIVED)

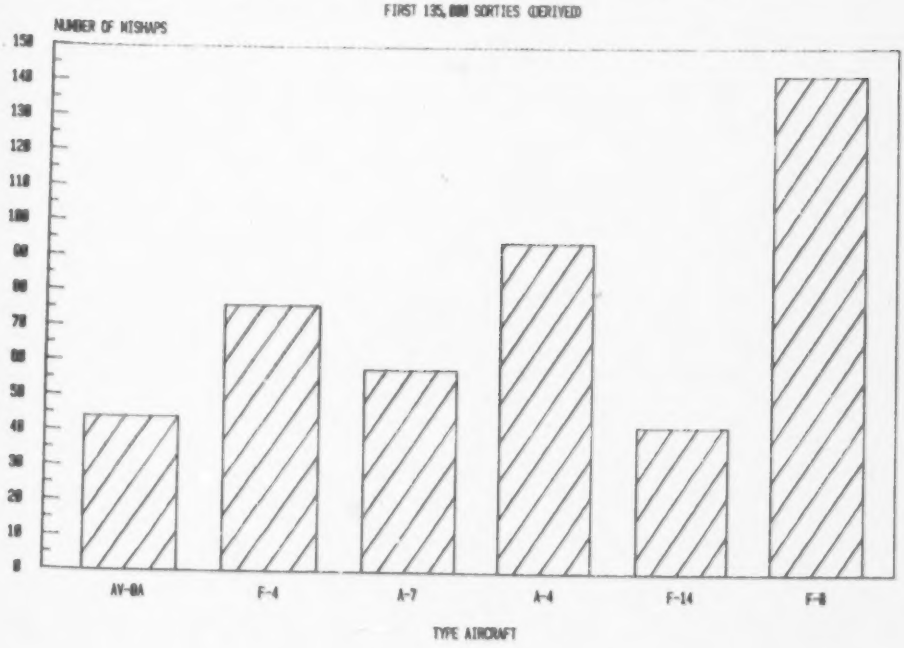


FIGURE 1

COMPARATIVE CLASS-A MISHAPS VS FLT HOURS

FIRST 135,000 FLIGHT HOURS

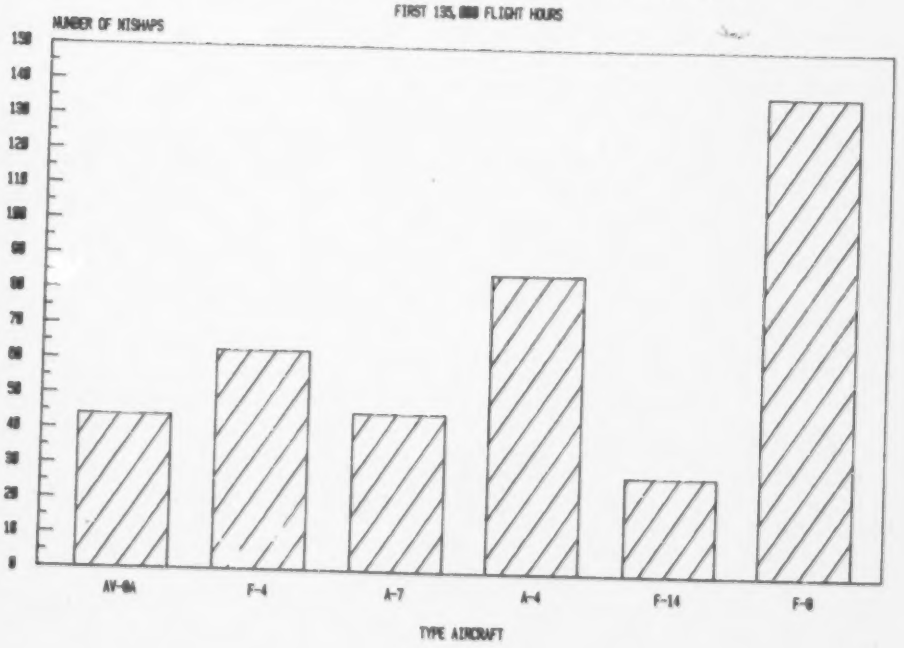


FIGURE 2

AV-8B/F/A-18 COST COMPARISON

Senator CANNON. General White, how does the cost of the AV-8B compare with that of the F/A-18 on a consistent basis?

General WHITE. Senator, as you are certainly aware, there are several accepted ways to compute costs of various weapons and weapons systems within the DOD. For the convenience of discussion here, I will proceed with the following simplified aircraft cost definitions:

Flyaway.—Airframe, engine and avionics-production only.

Weapons System.—Flyaway, plus support and advance procurement.

Procurement.—Weapons system, plus initial spares.

Program.—Procurement, plus RDT&E and MILCON.

Life Cycle.—Program plus total operating cost.

Previous cost comparisons have been based on "program costs" or sometimes referred to as "program acquisition costs." A cost comparison, based on program costs, made specific to AV-8B and F/A-18, does not result in a clearly consistent conclusion for the following reasons:

The two programs are four years out-of-phase with each other. This means that the AV-8B has 4 additional years of inflation built into the cost.

The two programs have different total procurement objectives: 336 for AV-8B and 1,366 for F/A-18 (1,366 F/A-18's originally included USMC light attack buy; subsequently these were replaced in DOD planning with 336 AV-8B's).

If modernization of DON Reserve forces accounts substantially for retaining the procurement objective of 1,366 F/A-18's, it is then consistent to consider a modernization requirement of the Marine Reserve Light Attack Force with AV-8B's. This could include an additional buy of approximately 127 AV-8B's for 6 squadrons of 12 aircraft each with pipeline and attrition. This would, on RDT&E amortization alone, reduce the program unit cost from 30.9 to 29.9 million. The additional, more significant reduction in unit procurement cost from adding 127 AV-8Bs for the Marine Reserve is not yet available. There would be some additional support costs to establish support sites. As the Reserve modernization program is more fully developed, we will be able to provide more definitive cost data.

Either program will suffer comparatively from failure to reach, or reasonably approach its planned economic production rates. A logical (and consistent) basis is to compare the cost of AV-8B and F/A-18 by showing the weapons system costs for the remaining years of production for each type aircraft.

This comparison can be made knowing that:

Production learning curves are nearly established for F/A-18, but are just getting started for AV-8B; the production rates of the two aircraft are quite dissimilar.

Fiscal year 1983 represents the last year for F/A-18 RDT&E, while the AV-8B has 4 years (including 1983) remaining.

To be consistent, spares costs have not been considered in this comparison. USMC analyses show that AV-8B initial spares costs in the fiscal year 1983 budget submit are sufficient to support the carefully planned deployability requirements of Marine Aviation. Similar initial spares data for the F/A-18 is not available.

From the weapons system cost comparison of Figure 1, the following conclusions can be made:

Even with the reduced procurement schedule shown in the fiscal year 1983 budget, the AV-8B cost is less than F/A-18 cost in 1985 and beyond.

Using the September 1981 SAR procurement schedule, which represents both the minimum USMC requirement and an economical production rate, the AV-8B cost is less than F/A-18 cost in 1984 and beyond.

A comparison of total weapons system cost (fiscal year 1983 to program completion) for 324 AV-8Bs and 1208 F/A-18s (at reduced AV-8B production rate) favors the AV-8B by $1.3 million per aircraft.

A comparison of total weapons system cost, (fiscal year 1983 to program completion using September 1981 SAR production rates for AV-8B) favors the AV-8B by $1.9 million per aircraft.

In fiscal year 1983 the marginal cost of 6 additional AV-8Bs appears to be $12 to $15 million less than the marginal cost of 6 F/A-18s due to the difference in the current cost reduction (learning) curves of the two aircraft.

A COMPARISON OF AV-8B AND F-18 COSTS

(BASED ON WEAPONS SYSTEM COST)
MILLIONS OF DOLLARS

FY 83 PRESIDENTIAL BUDGET REQUEST

AV-8B	83	84	85	86	87	COST FY83 TO COMPLETION	TOTAL
Aircraft Quan	18	30	48	60	60	324	336
Cum	30	60	108	168	228		
Wpns Sys Cost	751	882.1	1191.9	1355.7	1331.6	7657.5	8359.3
/Unit	41.7	29.4	24.8	22.6	22.2	23.6	24.9
COST CROSSOVER							
F-18							
Aircraft Quan	84	96	108	132	132	1208	1336
Cum	242	338	446	578	710		
Wpns Sys Cost	2727.6	2720.9	2843.9	3283.3	3342.1	30077.9	35555.8
/Unit	32.5	28.3	26.33	24.9	25.3	24.9	26.0

FY 83 BUDGET—ACCELERATED AV-8B SCHEDULE

AV-8B	83	84	85	86	87	TO COMPLETION	TOTAL
Aircraft Quan	24	54	54	60	60	324	336
Cum	36	90	144	204	264		
Wpn Sys Cost	931.5	1217.2	1249.5	1355.7	1331.6	7460.8	8162.6
/Unit	38.8	22.5	23.1	22.6	22.2	23.0	24.3
COST CROSSOVER							
F-18							
Aircraft Quan	84	96	108	132	132	1208	1366
Cum	242	338	446	578	710		
Wpns Sys Cost	2727.6	2720.9	2843.9	3283.3	3342.1	3077.9	35555.8
/Unit	32.5	28.3	26.33	24.9	25.3	24.99	26.0

FIGURE (1)

AH-1T ATTACK HELICOPTER

Senator CANNON. General White, does the Marine Corps plan to provide the AH-1T with a self-designation capability for the Hellfire missile—in addition to the designation capability to be provided by ground-based laser systems?

General WHITE. Yes. In addition to our ground based MULE designators, and our OV-10D and A-6E airborne designation capability, the Marine Corps plans to incorporate an autonomous laser device in the AH-1T to provide designation for the Hellfire missile and ranging information for the TOW missile.

Senator CANNON. What improvements to the AH-1T does the Marine Corps plan to improve the night capability to attack helicopters? Will this include a pilot's night vision system?

General WHITE. We plan to achieve a limited AH-1 night capability with third generation night vision goggles, a blue light cockpit, and a FLIR Augmented cobra TOW Sight (FACTS). These items will also provide a limited night target acquisition capability for the HELLFIRE missile, the present 20mm turret, and other forward firing stories. A pilots' night vision system (PNVS FLIR) is not planned for the AH-1.

Senator GOLDWATER. The meeting will stand adjourned.

[Whereupon, at 10:10 a.m., the subcommittee adjourned, subject to call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

THURSDAY, MARCH 16, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

AIR FORCE TACTICAL PROGRAMS

The subcommittee met, in executive session, at 8:55 a.m., in room 212, Russell Senate Office Building, Senator Barry Goldwater (chairman) presiding.

Present: Senators Goldwater and Byrd of Virginia.

Staff present: Robert S. Dotson, George K. Johnson, Jr., José E. Martinez, and Carl M. Smith, professional staff members; and Tamara L. Jones, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Frank Krebs, assistant to Senator Cannon; and Gray Armistead, assistant to Senator Byrd.

OPENING STATEMENT BY SENATOR BARRY GOLDWATER, CHAIRMAN

Senator GOLDWATER. The committee will come to order.

Today the Tactical Warfare Subcommittee meets to receive testimony on Air Force tactical programs.

Among the major issues which the witnesses have been asked to address are the F-15E and the F-16E, Lantirn, IR Maverick, the alternate fighter engine, and the AMRAAM. We are also interested in hearing of the Air Force's plans to equip our air defense squadrons and the projected 40 tactical fighter wings.

The committee welcomes Dr. Alton Keel, Assistant Secretary of the Air Force for Research, Development, and Logistics; Maj. Gen. Robert Russ, Director of Operational Requirements; and Maj. Gen. Perry Smith, Director of Plans.

Gentlemen, it is a pleasure to have you here. Please proceed as you wish.

If you have never been here before, Dr. Keel, we will be glad to point out the different aspects of the room for you. [Laughter.]

STATEMENT OF HON. ALTON G. KEEL, JR., ASSISTANT SECRETARY OF THE AIR FORCE, RESEARCH, DEVELOPMENT, AND LOGISTICS

Mr. KEEL. Thank you, sir. I will need all the help I can get.

91-866 O—82——38

Mr. Chairman, Lieutenant General Burke will not be able to be with us today. He unfortunately is a bit under the weather.

We do have, of course, Major General Russ and Major General Smith here. We worked with your staff in preparing today's hearings, both content and format. What I will do, with your permission, is simply enter my prepared statement in the record and just give a very few brief summary remarks.

Senator GOLDWATER. That may be done.

Mr. KEEL. Then I will turn to Major General Smith to present Air Force missions and requirements. He will be followed by Major General Russ, to present our Air Force programs.

I think it is important, Mr. Chairman, as we examine the defense budget and debate defense spending, that we keep in perspective the threat, because it is only in the context of the threat that we can judge the adequacy of our defense budget, so it is beneficial to remind ourselves of the steadfast commitment to defense on the part of the Soviets.

In so doing, if we make a comparison of Soviet military investment to U.S. military investment—and, as you know, military investment or so-called defensive investment consists of procurement, research and development, and military construction—if you make that comparison of the Soviet and U.S. defense investments, you find today the Soviets are out-investing us in weapon systems by 2 to 1. In fact, over the last decade the Soviets have invested $400 billion more in weapon systems, $230 billion more in procurement, $100 billion more in research and development and $70 billion more for construction.

In fact, if you examine the President's 5-Year Defense Plan that he is proposing to the Congress for their approval, which is a very ambitious and bold step but does not attempt to remedy all of our deficiencies overnight, if you examine that 5-Year Defense Plan you will find that the Soviets will continue to out invest us in weapon systems by a substantial margin throughout the 5-Year Defense Plan, even with the President's increased defense budget.

The consequences of the Soviet advantage in investment manifests itself in not only increased numbers of systems but also in increased quality of systems.

TACTICAL FIGHTER PROCUREMENT

For example, in tactical fighter procurement the Soviets are now out producing the United States by 2½ to 1. Over the last decade they have bought roughly twice the number of fighter aircraft that the United States has procured. In fact, the Soviet Flogger procurement alone exceeds all U.S. aircraft procurement including FMS and combined procurement of all three Services.

With the Soviet rate of aircraft production, we could replace our entire active U.S. Air Force tactical fighter force every 17 or 18 months. With the U.S. rate of Air Force procurement proposed for fiscal year 1983, it would take us 25 years to replace the Soviet tactical fighter force.

In addition, by sustaining this increased production rate they have not only surpassed us in numbers but also they are proceeding at a breathtaking pace of modernization, the consequences of

which have been their developing more and more capable weapon systems. In fact, if you examine the Soviet fighter aircraft, their third-generation fighter aircraft, their MIG-23 and MIG-27 Flogger, and MIG-25 Foxbat, and fourth-generation aircraft, the RAM-K and RAM-L series which are comparable roughly to the F-15 and the F-16, you will find that the Soviets now have an advantage in average speed; they have an advantage in thrust to weight; and they have an advantage in combat radius for air-to-ground.

The Soviets truly are developing a formidable offensive air force and constitute a significant threat.

With that comparison, it is imperative, in my view, that we sustain the increased levels of defense requests that we have proposed to you. The threat has not diminished, in my opinion, so we call on you for your support and that of the committee to sustain the request that we have asked for and to sustain that commitment throughout the 5-Year Defense Plan, which is what we require.

Thank you, Mr. Chairman.

[Prepared statement of Mr. Keel follows:]

PREPARED STATEMENT BY HON. ALTON G. KEEL, ASSISTANT SECRETARY OF THE AIR FORCE, RESEARCH, DEVELOPMENT, AND LOGISTICS

Mr. Chairman and members of the committee, I welcome this opportunity to meet with you today to report on air Force Research and Development, Acquisition and Logistics Programs and the fiscal year 1983 budget request for these programs. It is only appropriate that we start with a discussion of the threat we face as a nation from the Soviet Union and the Warsaw Pact countries. This threat determines the priorities as well as the substance of our fiscal year 1983 and Five-Year Defense Programs. Our decisions today will determine whether we develop and field those weapon systems needed to meet the Soviet challenge in the late 1980s and beyond. The need to meet this challenge comes at a time when domestic pressures are mounting for us to review, and perhaps, to revise our national priorities of defense versus nondefense spending. It is imperative in this environment that we review the threat and, hence, the need for our defense request.

In addition, I would also like to discuss our commitment to get the most out of the defense dollar. We are firmly committed to increasing efficiency and to reducing waste in our weapon system acquisition process. Furthermore, we are dedicated to improving supportability and maintainability of the systems we do procure. In short, we want to field cost-effective weapon systems which are fully supportable in the operational environment. We cannot afford to do less . . . and we will not settle for less.

Now, let me begin by addressing the Soviet Challenge we face, as I view it. It is important as we examine and debate U.S. defense spending that we keep in perspective the magnitude of the Soviet buildup and the steadfast commitment on the part of the Soviets to sustain defense investment. It is thus of benefit to review and update the trend in Soviet military investment and to examine the consequences.

First, to appreciate fully the extent of the Soviet and Warsaw Pact commitment to national defense, it is interesting to make the following comparisons of resources between the Warsaw Pact and the Atlantic Alliance and Japan. The Alliance and Japan has a roughly two-to-one advantage in population or people resources over the Warsaw Pact. The Alliance with Japan has over a three-to-one advantage in gross national product, or gross domestic product over the Pact. Yet with this advantage in population and in national wealth, the size of the Alliance defense effort—priced in dollars—is only 10 percent more than that of the Pact.

This comparison does not tell us whether our defense effort is too large, too small, or just right. It does illustrate, however, that the size of the Warsaw Pact defense effort is three times greater as a precent of gross national product as that of the Alliance. Thus, it is difficult to sustain an agreement that we cannot afford more for defense if, in fact, we judge it is required.

To understand the significance of this relative comparison of total defense effort we must examine its components. In so doing we determine that in terms of so-called military investment—procurement of weapons, research and development for weapons, and military construction for support of weapon systems—the Warsaw

Pact effort is significantly larger than the Alliance. Furthermore, the Warsaw Pact has been out investing the Alliance in weapon systems since about 1972. In fact, the cumulative asymmetry in investment over the 10-year period from 1971 to 1982 now favors the Warsaw Pact by about $100 billion. But even this comparison of military investment between the Warsaw Pact and the Alliance does not truly reflect the total inherent advantage that the Warsaw Pact accrues from this edge in investment.

There are other considerations which make this advantage greater.

First, the Soviet Union contributes 90 to 95 percent of the total military investment of the Warsaw Pact, and hence imposes control over use of those resources. The United States effort, on the other hand, constitutes about 60 percent of the Alliance military investment. With the Soviet Union in control of almost all of the Warsaw Pact military investment, the result is a more efficient and effective use of those resources. There is less duplication and less redundancy in forces and in military capability. Secondly, and perhaps most significantly, there is greater efficiency through procurement of larger numbers of given types of weapon systems. Thus, the "effectiveness" of the Alliance military investment as compared to that of the Warsaw Pact is clearly less or the advantage to Warsaw Pact in "effective" military investment is even greater.

To put the magnitude of the Soviet defense commitment in true perspective, we must compare directly Soviet military investment to U.S. investment. In making that comparison, we find that the Soviet Union today is out-investing the United States in weapon systems almost two-to-one. Over the last decade the dollar costs of Soviet efforts have exceeded those of the United States by over $400 billion more in weapon systems than has the United States—$230 billion more in procurement of weapon systems, $100 billion more in research and development for future systems, and $70 billion more for military construction to support weapon systems. In fact, the Soviet Union's investment efforts have been larger than those of the United States for about the last 15 years.

It is significant to note that a sustained gap between United States and Soviet military investment will persist through the period of the President's Fiscal Year 1983 Five-Year Defense Plan, even with the projected increases in defense spending. The Soviet Union has been, is now, and will be investing more in defense—even with the President's new Five-Year Defense Plan. Yes, the President's plan is a bold start which will begin to reverse adverse trends in the military balances. But it cannot be done in a few years, and that is not our intent. To meet the challenge, we must sustain a continuous, steadfast commitment to allocating sufficient resources for defense.

The military benefit to the Soviet Union, owing to their advantage in military investment, manifests itself into two principal ways.

First and most obvious, the advantage in military investment has correlated into a substantial Soviet Union advantage in numbers or quantity of weapon systems, especially in conventional forces. Secondly, this steady, sustained Soviet advantage in military investment has also now translated into an unprecedented pace of modernization of Soviet military forces. The consequence of which, of course, is higher quality weapons. We can see both these trends if we examine Soviet fighter production, as a typical example.

In total tactical fighter production the Soviets are outproducing the United States by better than 2½ to one. Over the decade of the 1970's the Soviets produced more than twice the number of fighter aircraft as the United States. The production rate of the Soviet Flogger alone exceeds all U.S. fighter aircraft production. With the Soviet rate of aircraft production, we could replace our entire active U.S. Air Force Tactical Fighter force every 17 or 18 months. With the USAF rate of fighter aircraft production planned for fiscal year 1983, it would take us over twenty-five years to replace the Soviet tactical fighter force.

In fact, overall, the Soviets are out-producing the United States in weapon systems about three-to-one, while the estimated dollar cost of the Soviet effort exceeds ours by two-to-one. The Soviets accomplish this not by buying simpler less expensive systems but by using the leverage of greater military investment to take advantage of the economies of scale. With the advantage in military investment, the Soviets buy more systems at more economical rates, and thus at lower unit weapon system costs than would otherwise be possible.

With this advantage in aircraft production, the Soviets have attained and maintained a numerical superiority. Moreover by sustaining this rate of production, this advantage has translated into a Soviet pace of fighter aircraft modernization which far surpasses that of the United States. The consequence has been an increasingly modern Soviet air force.

So as a result of the sustained Soviet military investment, today about two-thirds of their 4500 air-to-air fighters are new generation aircraft—the so-called "third generation" aircraft, such as the MIG-23 and MIG-27 Flogger, the MIG-25 Foxbat, and the SU-24 Fencer. These new generation aircraft are replacing the older second generation aircraft—the MIG-19 and MIG-21 series and so on. More impressive perhaps is the fact that within the next year or so the Soviets will begin introducing their next fourth generation aircraft. So they are programmed to begin introduction of their future generation aircraft before they even complete the current introduction of their new aircraft. The obvious result, of course, is that the Soviets are extensively modernizing their air force with more and more capable aircraft. The average age of their fighter force is about 5½ years—or about one-half the average age of the U.S. figher force.

The next pertinent question is how capable are the new Soviet aircraft. The simple answer is—quite capable. Comparisons of USAF F-15 and F-16 aircraft with the new generation Soviet aircraft as well as the future generation Soviet aircraft indicate areas where the Soviets have an advantage—average speed, thrust-to-weight ratio, air-to-ground combat radius.

In short, the conclusion is that the new Soviet aircraft are indeed highly capable. The Soviet air force represents a formidable offensive threat and is attaining an increasing ability to project force.

Similar conclusions can be reached with respect to the evolving U.S.-Soviet military capability and with respect to the shifting U.S.-Soviet force balance from analyses of other mission areas. The Soviet's publications document their own start and sobering conclusion.

On the cover page of the January 15, 1980 edition of the Soviet Red Star publication, the Soviets state "With respect to the military balance, the correlation of forces has shifted." Based on the evidence, it is difficult to argue with this statement. The Soviets also assert that the balance has shifted "Once and for all and irrevocably." This assertion is unacceptable! The challenge we face is to make sure that this will not be the case.

Our success in meeting this challenge will, to a great extent, depend upon our maintaining a continuing commitment to rebuilding our nation's defenses. We are beginning to make progress. Over the past few years, we have had real growth in funding, and our Fiscal Year 1983 request is another strong step forward toward meeting the Soviet challenge. We must not waiver from our commitment. The threat has not diminished, nor should our resolve.

STRATEGY FOR THE 1980'S

Mr. Chairman, as indicated by the above discussion, it is clear that we face an adversary with serious long term goals incompatible with our own, whose defense efforts far surpass legitimate defensive needs. We must therefore undertake a sustained effort to increase the ability of the United States and our allies to protect our common interests and to deter any use of force.

The United States remains committed to a defensive use of military strength. Our objective is to deter aggression or to respond to it should deterrence fail. It is not to initiate warfare or pre-emptive attacks. This requires that our military forces be prepared to respond after the enemy has taken the initiative and to react so strongly that our counterattacks will inflict unacceptably high cost on the enemy—a requirement that puts a heavy burden on our readiness and intelligence capability.

This places the highest priority upon assuring that we have military forces and the command, control, communication and intelligence (C^3I) that can respond to a variety of potential crises of extended duration.

Let me highlight our Air Force programs designed to meet our defense requirements.

STRATEGIC SYSTEMS

Over 40 percent of the fiscal year 1983 Air Force RDT&E program is devoted to strategic offensive and defensive forces. This emphasis is dictated by the need to upgrade our strategic capabilities and to redress the imbalance in U.S.-Soviet strategic forces. The fundamental objective of our strategic nuclear forces is to deter nuclear attack. In light of substantial Soviet commmitment to strategic force buildup, the ability of our strategic forces to maintain their deterrent value must be ensured by a series of steps for force modernization.

Last October President Reagan announced a comprehensive plan for strategic force modernization. The intent of our program is to strengthen deterrence of nuclear war by denying the Soviets any realistic prospects of gaining an advantage by

initiating the use of nuclear weapons. Survivability and endurance are key attributes of this plan.

There are five mutually reinforcing elements of the Reagan program: (1) improvements in strategic command, control, and communications (C^3) systems; (2) modernization of our strategic bomber force; (3) development of new submarine-launched ballistic missiles; (4) a step-by-step plan to improve the capability of our ICBM's and to reduce their vulnerability; and (5) improvements in strategic defense. The Air Force is responsible for carrying out much of the President's strategic program.

Over the past decade we have developed impressive C^3I capabilities for peacetime use. However, we have not made these systems as survivable as we would like, nor have we provided a reliable post-attack C^3I system. Thus the President's program placed the highest priority to improvements in our warning systems, command and communication links, including the capability of a post-attack reconstitution to ensure enduring C^3I. These improvements, which are supported in the Air Force budget, are intended to ensure that we can effectively employ our nuclear forces throughout all stages of a conflict and thus maintain a credible deterrent.

A critical and growing challenge facing us today is improving the capability and survivability of our land-based ICBM forces. The MX missile under development is the cornerstone or our plan to improve ICBM capability. A key objective of our plan is a survivable and enduring basing mode. Several options are being evaluated and a selection of the preferred mode will be made in July 1983.

The Army has the lead in pursuing ballistic missile defense (BMD) alternatives that represent evolutionary improvements over concepts of the past. The Air Force is working closely with the Army to assure effective coordination of BMD efforts with our MX deceptive basing efforts. It is essential that full cooperation and communication be achieved and all levels of management are dedicated to accomplishing this.

Historically, the unique military characteristics of the manned bomber have provided a vital dimension of flexibility to our strategic and tactical forces. Bombers are the only element of the Triad that can be launched prior to a decision to employ these weapons.

The B-52s have been the mainstay of our manned bomber forces for the past 25 years, but their ability to continue to serve effectively in the penetration mission is diminishing.

The limitations inherent in the B-52 make it imperative that we start fielding a replacement aircraft now. We have begun a timed-phased bomber modernization program designed to produce 100 B-1Bs which will have an initial operational capability (IOC) in 1986 and produce an Advanced Technology Bomber (ATB) with an estimated IOC in the early 1990s.

Acquiring the B-1B while continuing to pursue the ATB is the most prudent approach for revitalizing our bomber forces. This approach enables us to field the necessary additional forces required during a period when the United States must depend heavily on bombers, while we take the proper steps to strengthen our land-based missiles. It will also provide time for an orderly and logical development pace of the ATB to capitalize on this important technology and avoid the costly major redesigns likely in a too rapidly paced program. In addition, a combined force of B-1Bs, ATBs, and cruise missiles will place maximum stress on Soviet air defenses and provide the United States with significant leverage in our long-term strategic competition with the Soviets.

We are continuing development and procurement of the Air Launched Cruise Missile (ALCM), the only major near-term initiative we have to counter the growing expansion of Soviet strategic capabilities. The ALCM enhances our bomber's capabilities by providing greater weapons accuracy, increased flexibility for bomber routing and targeting, reduced bomber exposure to defense, and defense saturation.

Tanker aircraft are a vital part of our bomber and conventional forces. In the KC-135 program, the major effort is to replace the current engines with CFM56 modern technology engines. Reengining with CFM56 is the most cost-effective means of alleviating a serious and growing tanker shortfall. In addition, the new engines will offset the high and growing costs of operating and maintaining the present aging engines.

In the area of strategic defensive systems, we have large gaps in in radar coverage provided by the North American Defense Warning Network, our strategic air defense interceptors are obsolete, and our anti-satellite and ballistic missile defense programs have lagged behind those of the Soviets. As indicated above, the President's program calls for vigorous research and development on ballistic missile defense. It also takes the first steps toward improving the other components of our strategic defensive forces.

The North American air surveillance network will be upgraded in coordination with Canada. The plan includes some combination of over-the-horizon backscatter (OTH-B) radars, AWACS aircraft, and improved versions of the ground radar systems that exist today. It also calls for replacing the aging five squadrons of F-106 interceptors with new F-15s. Additional AWACS aircraft will augment the ground-based radars in peacetime and will provide surveillance and control for interceptors in wartime. We also plan to continue to demonstrate an anti-satellite system as a counter to the capability already demonstrated by the Soviets.

SPACE-RELATED ACTIVITIES

Finally, Mr. Chairman, I want to conclude this part of the statement with a brief discussion on space and space-related systems. Our systems have unique capabilities enabling many missions to be accomplished more efficiently than with earthbound systems. The United States is becoming increasingly reliant on these systems for such missions as navigation, communications, and surveillance and this dependence will increase.

We are developing navigation systems such as the NAVSTAR Global Positioning System that will provide extremely accurate position and navigation information, to be used by all services as well as the civil sector. We also have requirements for expanded global communications from space as well as highly jam-resistant and survivable satellite communication for tactical and strategic command elements.

The importance of space systems for the United States is well realized by the Soviets, who have the world's only operational Antisatellite (ASAT) system. To ensure our systems are available when needed, we are examining methods to increase survivability. The United States also recognizes the value of Soviet space systems and is developing an ASAT system to ensure that space does not become a Soviet sanctuary.

In addition, the Department of Defense is committed to the Space Shuttle and has worked closely with NASA to develop methods of exploiting the Shuttle's capabilities. The Air Force is developing the Inertial Upper Stage booster and building a Shuttle launch capability at Vandenberg AFB to support civil and military missions requiring higher orbit inclinations, which cannot be flown from Kennedy Space Center. The Vandenberg launch facilities are planned to support an October 1985 initial operating capability.

CONVENTIONAL FORCE PROGRAMS

Turning our attention now to conventional forces, the major threat facing our general purpose forces continues to be the numerically superior forces of the Soviet Union/Warsaw Pact. Western strategy has relied heavily upon technological superiority to offset this quantitative advantage. Accordingly, we are pursuing carefully selected general purpose programs which enhance the flexibility, deployability, forepower, and relatively quick response to our tactical air force.

The most demanding conventional threat the United States must deter and counter is an attack on Western Europe by the Warsaw Pact. To meet the Soviet challenge, we have constructed a force improvement plan for maintaining our qualitative edge. In the near term, we will develop evolutionary improvements to our existing fighters while continuing balanced procurement of the F-16 and F-15.

To deal with our disadvantage in numbers as well as the dense defenses of the Warsaw Pact, we are emphasizing weapons that achieve much higher effectiveness through accuracy and lethality, while reducing aircraft attrition through standoff or reduced exposure.

Over the last few years Soviet tactical air has changed from primarily a limited range defensive force to a formidable offensive force.

They now have the capability to conduct strikes against targets anywhere in NATO Europe. To meet this challenge, the Air Force must continue to procure and improve F-15 and F-16 fighter aircraft. Our RDT&E emphasis is on increasing the air-to-air capabilities of our fighters. The most important improvement under development is the AMRAAM, employing technology which gives it a high kill probability from standoff ranges.

Soviet air defense systems continue to grow in density, quantity and complexity as the Soviets develop and deploy new tactical and strategic air defense systems. These new systems emphasize mobility and use both radar and electro-optical means for target acquisition and tracking. Growth in their air defense capability has also been marked by increased reliance on command, control, and communications as they strive to maintain a highly reliable, efficient, and integrated system.

Because of this growing threat, we have and will continue to place considerable emphasis on electronic combat. Our objective is to achieve a mix of systems which disrupt, degrade, deceive, or destroy an enemy's air defense network in order to ensure the survivability of our aircraft and aircrews. To accomplish this, we have programmed updates for our operational defense suppression systems, as well as continued development of several new systems to handle the highly sophisticated Soviet threat.

To protect our global interests, the United States deploys some forces forward, prepositions limited amounts of material, but maintains the majority of our forces and supplies at home.

These home-based forces, supported by mobility resources, serve as a centrally located strategic reserve which can be projected anywhere in the world.

Airlift is the most visible, responsive, and flexible element of our mobility resources. Its primary role is to project and sustain combat forces until other means of transportation can deliver the required follow-on support. In many situations, airlift is the only means of responding rapidly, because of either the geographic location or the speed with which the threat develops.

Existing airlift is seriously inadequate to meet the mobility requirements of our conventional war strategy. The Air Force RDT&E and procurement strategy will begin correcting the airlift shortfall. We have ongoing programs to improve the readiness, sustainability and capabilities of our current aircraft. Our programs include increasing spare part stocks and crew ratios to permit higher utilization rates of our C-5 and C-141 aircraft. In addition, we plan to increase inventories of C-5 and KC-10 aircraft.

To make full use of our investments in modern weapon systems and munitions we must make similar investments in readiness and sustainability and thus assure that our forces are ready for combat on short notice and capable of sustained military operations over a considerable period. We must have the proper mix of modern equipment and well trained, dedicated people supported by modern repair facilities, sufficient spare parts, and adequate stocks of effective munitions to achieve such readiness and sustainability.

In our fiscal year 1983 budget submission, we have continued to place priority emphasis on improving the combat preparedness and staying power of our forces. This is necessary in view of the significant deficiencies in our present ability to sustain effective combat and the very real possibility that we may be required to use military force to defend our global interests over the next few years.

TECHNOLOGY INITIATIVES

Now, I would like to discuss another aspect of meeting the Soviet challenge—namely, maintaining our technological edge. The nature of our worldwide commitments almost guarantees that our forces will be outnumbered, especially in the crucial early phases of conflict. Today we have that technological edge which can alleviate some of this imbalance. However, while maintaining their dedication to overall numerical superiority, the Soviets are narrowing the technology gap.

We must continue a strong research, development, test and evaluation program which investigates technology that will enable us to counter future threats and correct military deficiencies. The goal of our Technology Base Program is to use advanced technology to develop more effective weapons that are also reliable, maintainable and, above all, affordable.

The fiscal year 1983 Technology Base Program is our response to the challenges to our future. It provides a lean, focused foundation for national initiatives in science and technology to exploit promising breakthroughs for operational usage.

As indicated we will emphasize technology application to make our system more reliable, more maintainable and in general more supportable.

In the area of logistics, for example, the demands of our new and future weapon systems and the diversity and dynamics of logistics force structure underscores the importance of a comprehensive logistics R. & D. program. Logistics employs over 40 percent of our Air Force work force and accounts for 30 percent of the dollars which directly affect readiness and force sustainability. Research and development is needed to assure the supportability of our emerging weapon systems and to gain knowledge of how logistics force structures must operate in the future.

A logistics long-range planning program is now being used to determine research requirements. We are strengthening the management structure and funding of the laboratories in both the technology base and engineering development. Laboratory development efforts which once focused exclusively upon performance improvements are now giving due consideration to supportability and cost.

Programs have been started to evaluate diagnostic and built-in test techniques to improve weapon system and component maintainability and to reduce the burden of maintenance at the unit level. We are examining battle damage repair concepts to enhance our war fighting capability. In addition, we see such electronic technologies as Very High Speed Integrated Circuits (VHSIC) and solid state active aperture radar modules having the potential of appreciably improving our current capabilities for both performance and support.

The United States strategy for dealing with the Soviet military challenge is critically dependent on the effective exploitation of the broad based U.S. technology. During the past year, the Defense Science Board conducted a Summer Study on the Technology Base and made recommendations aimed at improving the responsiveness of the Technology Base to national security needs. Additionally, other initiatives were begun this past year for improving the Service Laboratories, increase the university involvement and maintain a viable, highly trained scientific workforce. I can assure you the Air Force is working very closely with the Office of the Secretary of Defense and other Services to make sure that we are getting the most out of our Technology Base dollar and people resources.

EFFECTIVE MANAGEMENT

Mr. Chairman, I would like to conclude with a discussion of the complementary aspect of increased defense spending—namely, the need to get the most out of every defense dollar. To get the most out of what we spend; we must not only strive to maximize efficiency and reduce waste but also to invest wisely for the future. In that regard, we must never lost sight of the need for a healthy and productive technology base as indicated above . . . small investments today can save us significant costs tomorrow.

Another challenging responsibility of the Air Force is to prepare and implement policies which provide for effective resource management of current and planned weapon system programs included in the budget. In response to the initiatives of the Congress, we are decentralizing program management responsibility, implementing new management policies, and stressing energy conservation.

In accordance with overall Department of Defense guidance, the Air Force is now operating under a policy of "controlled decentralization". This gives the Air Force flexibility in developing specific policies to meet unique requirements, as well as allowing decisions to be made at the lowest level at which a total view of a given issue exists. Through controlled decentralization, milestone decisions on specific programs have been allocated to the Air Force System Acquisition Review Council, which I chair, and the Air Force major acquisition commands. In response to Congressional direction, we are also currently revising program reporting thresholds for all responsible decision levels.

The key management initiatives being implemented by the Air Force are multiyear procurement, economic order quantities, increased contract competition, incentives to improve reliability and support and policies to eliminate fraud, waste and abuse. The overall effect of these policies is to stabilize and improve our industrial base for defense programs while achieving economies for the Air Force.

We are making a concerted effort to increase the level of competition achieved in our contract awards. Under the aegis of the Defense Acquisition Reforms, actions are being taken to remove impediments to competition, where possible.

Over the last decade, our experience in fielding modern weapon systems has been one of persistent growth in weapon system support costs. In a concerted effort to reduce weapon system costs and control life cycle costs, we have prepared a product performance guide of potential incentives that can be used on appropriate acquisition programs.

With respect to fraud, waste and abuse, the Air Force has initiated several programs directed at recognizing, reporting, and eliminating these problems, especially as they relate to Air Force acquisition programs.

Mr. Chairman, I can assure you that these management initiatives have my personal attention and commitment. In today's environment of economic constraints, it is not enough to emphasize just the need for increased support of defense but also to commit to getting the most out of that support once it is given. There is no room for waste and inefficiency.

In conclusion, I would like to point out that the program represented by the Air Force's fiscal year 1983 budget request was constructed with considerable deliberation regarding required military capability, program priorities, and available resources. In order to take advantage of economic savings available on some programs, others had to be eliminated.

These hard decisions which have reduced or eliminated other programs should not be viewed as a reduction in our military requirement for these capabilities. Those decisions were tough, but so are the times. What we finally decided on are the absolute essentials to meet the Soviet challenge. There is no fat. With each succeeding year that we delay our response the challenge that confronts us becomes that much more formidable. There is now no time to delay. The time to act is now. We must continue to sustain full support for restoring our nation's military forces. The President's program is adequate to do so, but it will not do it overnight. It will take time and your dedicated, unequivocal support. We solicit that continued support.

Mr. KEEL. With your permission, I will turn to Major General Smith to present the Air Force's missions and requirements.

STATEMENT OF MAJ. GEN. PERRY M. SMITH, USAF, DIRECTOR OF PLANS, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR PLANS AND OPERATIONS, DEPARTMENT OF THE AIR FORCE

General SMITH. What I would like to do is give you a very short overview briefing of our planning function, how we do it, and talk about missions and requirements.

Senator GOLDWATER. That may be done.

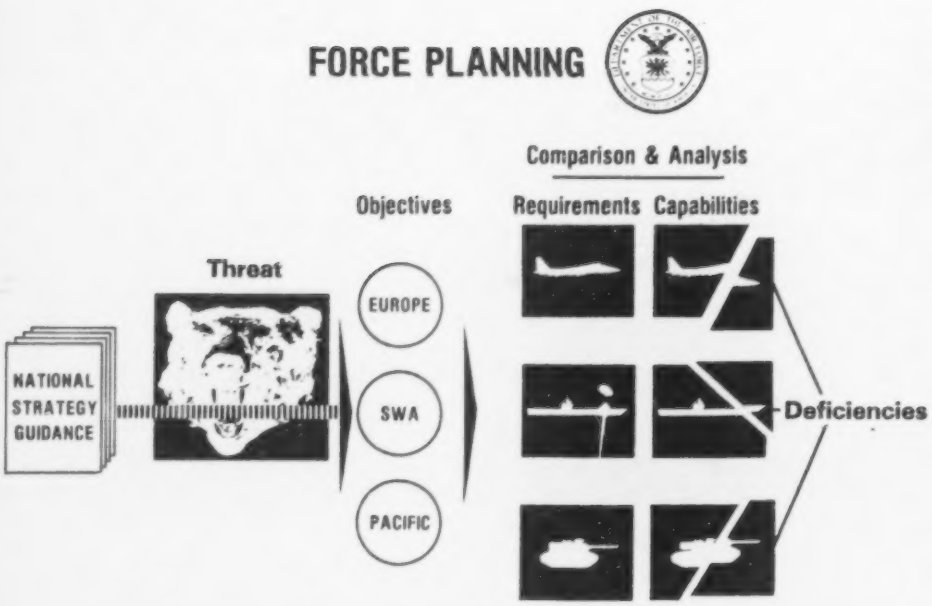
General SMITH. I would like to introduce myself. I think you know that I come from a fighter background. I returned from Europe last year after 4½ years over there where I was a wing commander of F-15's and had an operational tour in the Second Allied Tactical Air Force. I flew the F-15 for 3½ years, so I feel comfortable with the fighter role.

I have also brought with me three outstanding people with strong backgrounds in various fields—Colonel Powell, the Assistant Director for Operational Initiatives and Joint Matters, who just arrived on the air staff; Col. Will Abbott, who is our chief programer on the fighter side; and Col. Paul Brown, who works for me in plans in the fighter force structure. I will call on them during the question period if I may.

OVERVIEW

Force planning process.
Guidance.
Threat.
Requirements by theater.
Available forces.
Limitations.
Air Force solution.

The overview briefing, as I mentioned, will be a short briefing to give you a bit of the feeling of the planning process. That is shown here on this slide.



We have to start, of course, with our national strategy guidance which we get from the Secretary of Defense. We look very carefully at the threat and analyze the threat, as Dr. Keel has talked about, which is a significant and growing threat. Then we break it down into the three major areas of international concern—Europe, Southwest Asia, and the Pacific—to get specific requirements, and then after we develop those requirements we look at our capabilities, determine our deficiencies and try to build a force structure for the long term that will correct those deficiencies.

That is the process that we go through.

POLICY AND STRATEGY GUIDANCE

U.S. forces, in conjunction with appropriate allied forces, must be capable of dealing with Soviet aggression on a worldwide basis.

The policy and strategy guidance—and this is a quote out of the current defense guidance that came out last spring; there is a new defense guidance but it has not been published as yet—the important point here is that we must be capable of dealing with Soviet aggression on a worldwide basis. The guidance basically talks about "near simultaneity of war." That, of course, means that we have a very demanding force structure requirement because we have to be able to fight in more than one theater. That drives a lot of our planning and a lot of our thinking.

To remind you about the air threat that we face, it is a very large one and a growing one. Dr. Keel has covered it very nicely. We like to think in terms of [deleted] aircraft in the Warsaw Pact that we have to deal with; in addition, another 1,000 aircraft in Korea and Vietnam. They are well spread out; they are focused largely in Eastern Europe, but they are now spread out well over the globe.

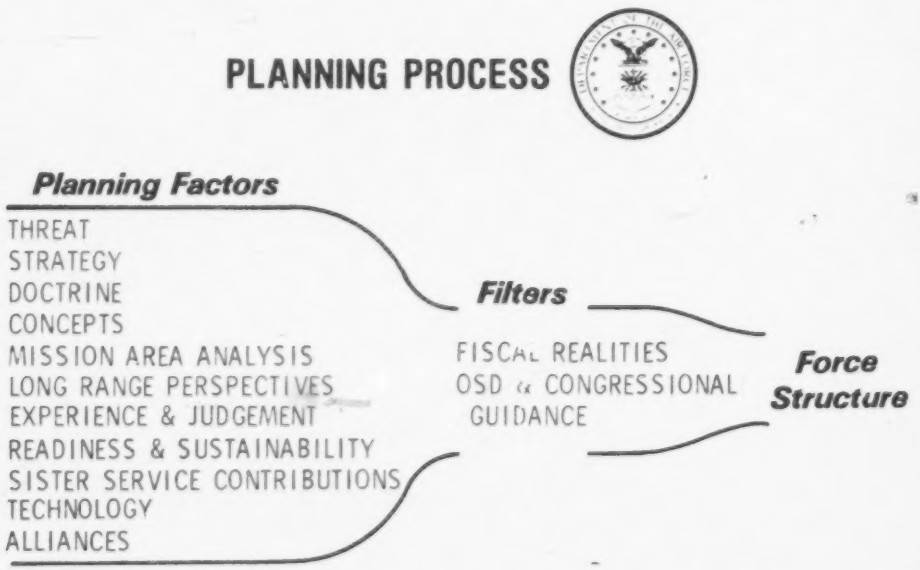
There has been a big buildup in Soviet Asia which increases the concern of our commanders in the Pacific. They have interior lines of communications to deal with which just increases our problem even more so.

Senator GOLDWATER. How many aircraft do we have in the NATO forces?

General SMITH. The NATO force structure—we are not dealing with the full [deleted] there—basically the odds are 2 to 1 in the NATO arena.

One of the problems you face is that it is a little easier for them to reinforce the NATO arena than it is for us, because of geographical proximity.

The army divisions are an important aspect. We work very closely with the Army. The army divisions in the Soviet Union and Warsaw Pact are also now spread very carefully and completely across the globe. We face the army threat and we are concerned about that. In fact, in many ways the Army threat is as important to us as the air threat.



Now, how do we do the planning process? There has been a lot of debate in the last few months on how that is done, but we must take into account a lot of factors. The threat, of course, is very important. We have to look at the national strategy.

In addition, we have to combine all the other factors together. The mission analysis process has matured a lot, to help us find out where our capabilities are and where our deficiencies are. We try to take a long-range perspective. We are looking at the year 2000 to make sure we don't get too focused on the present. We have to throw out a lot of experience and judgment to make sure that the analysis is tempered by those kinds of factors.

We have received a lot of help from the Congress in this regard. We are making great strides in this area but we have to be able to sustain the momentum to make sure we are strong and ready to fight tomorrow, if necessary.

A lot of work with the sister services is required to make sure we fully factor their contributions to the defense, as well as our allies. We do that in a very sophisticated way. Working very closely with General Russ and Systems Command, we want to make sure our planning takes into account all the technological factors so that we exploit the one big advantage we have over the Soviets, and that is, our technology.

Then after we do all of that, we have to put it in some kind of realism. We are filtered by fiscal realities. We are also filtered by OSD and congressional guidance. Finally, we come out with a force structure recommendation which tries to take into account the realities of the fiscal environment.

Although today it is much better than it was a couple of years ago, there are still very serious constraints on our ability to build the entire force structure we might need.

Now to get to the specifics of Europe, it is useful to remind ourselves of the distances involved and what the problems are.

The F-111 out of England can reach deeply into Poland, Eastern Germany, and Czechoslovakia.

The range of the F-4 and the F-16 is somewhat more constrained and even flying out of Hahn with a good payload it does not cover as deeply as we would like to see it.

Compare that with the Soviet situation. The Soviet fighters used to be short legged. This is no longer the case. You know the Flogger D has the same range as the F-16. The Fencer, of course, has considerably greater range, so we are dealing now with a very long-legged Soviet fighter force which we didn't have to deal with until recent years.

Now, when we get to Southwest Asia we have even bigger problems because the distances are so much greater. If you take a shot from Ras Banas in Egypt, that is about the same distance as it is from Germany to Moscow, so we are dealing with much greater distances, and that requires long-legged fighters and in many cases refueling in order to get the job done.

To give you a little bit of the feeling for the geography, again Ras Banas, Hahn Air Base, we are talking about all the way to Moscow if you go to the area of southern Iran.

To show you a little bit what the perspective might look like, with short-legged airplanes, if we had [deleted] that shows us what the F–4E can do with a good bomb load, and the F–16, again, if you try to hit targets in northern Iran those kinds of aircraft can't really do the job unless we have refueling. Again, there are requirements for long-legged fighters, particularly as it relates to Southwest Asia.

Senator GOLDWATER. Just for information, what would be the average height of the mountains that we would have to fly over?

General SMITH. The mountains in the Zagros are very similar to the Rockies. We are talking of some mountain passes 7,000 or 8,000 feet high, and some mountains higher than that. There are very high mountain ranges we have to deal with. That would be a factor as far as range payload is concerned.

Missions targeted to:
Disrupt enemy lines of communications.
Destroy enemy supplies.
Attack fixed, moving and movable point and area targets.
Destroy unengaged or uncommitted enemy attack formation before they can be brought into the battle.

To talk a little bit about interdiction, because it is a mission that is not fully understood by everybody, what we are talking about when we are talking about interdiction—and we will spend some time talking about it—here is what it is and what it is not. Tactical interdiction is not dropping bombs on ball bearing plants. Tactical interdiction is attacking the enemy's military capability.

We will show you some targets and how we will attack some of those and problems relating to that.

So, we want to disrupt their lines of communication, we want to destroy their supplies, attack fixed and moving targets, and destroy unengaged and uncommitted enemy attack formations.

The other main purpose is to support Army folks as well as Allies on the grounds.

Senator GOLDWATER. You have the F-111 for interdiction out of England. Is there any way you can use the F-15 for interdiction?

General SMITH. Yes, sir, and we will talk a little bit about that. We see the F-15 moving into the air-to-ground role in an interdiction sense; that is one of the reasons that we are looking at the derivative fighter, the F-15E/F-16E, to serve that job.

Senator GOLDWATER. How many weapons do you have in Bitburg?

General SMITH. We have the F-15; the F-111's are at Lakenheath and Upper Heyford. [Deleted.] Unfortunately, that is not enough airplanes because there are a lot of targets out there.

Senator GOLDWATER. That was my next question.

For an M-Day assignment with the targets you are going to have, how many F-111 aircraft would you need?

General SMITH. To do the interdiction you need somewhere in the neighborhood of [deleted] of those kinds of airplanes. Of course, the allies with their Tornadoes, Jaguars, Buccaneers, and so forth, can make a contribution. We could clearly need for the U.S. Air Force at least another [deleted] airplanes to do that job.

Senator GOLDWATER. Considering the total strike force in a percentage way or numbers way, what resources of aircraft would you need to really do the job when the whistle blows? What is your shortage?

General SMITH. We are in a situation of shortage as far as interdiction is concerned. The problem is when you look at the offensive counterair and defensive counterair jobs you have to do, and you look at the close air support you have to do, when you are sitting in central Europe and you are trying to find resources for interdiction, in many cases in the first few days of the war you don't have the resources to do that, with the exception of the F-111's, so the shortfall is very, very serious in interdiction; it would be in the neighborhood of probably [deleted] airplanes above what you have.

You do have the Tornadoes, Jaguars, and Buccaneers, and F-4's and A-7's, but there is clearly a requirement for long-range interdiction airplanes. The number is perhaps [deleted].

Senator GOLDWATER. The F-111 line is closed down?

General SMITH. It is closed down. We project the F-111 to stay in the inventory well into the 1990's. There is no aircraft coming off the production line. That is why we are looking at derivative fighters, the F-15E and the F-16E, to supplement the F-111. Neither

one of those aircraft will have the range of the F-111, but they will be much longer legged airplanes than we have at the moment.

Senator GOLDWATER. With the fuselage and skin tanks on the fuselage, what total range can you get on a F-15 now?

General SMITH. The F-15E or the F-15 with conformal tanks?

Senator GOLDWATER. I don't know what you call them, the tanks on the fuselage.

General SMITH. May I defer to somebody for an answer?

Colonel BROWN. If you are looking at a profile, sir, in Eastern Europe, we would see that with a good payload probably in the order of [deleted].

If you are looking at a Southwestern Asia scenario, again depending on the mission and type of load on the airplane, with a mission-type load you could push it out to [deleted].

With a heavy interdiction type load, we are looking at somewhere in the neighborhood of [deleted].

General SMITH. In that case, you would be higher and longer. In Europe you want to get low before you hit the front lines because of the heavy defenses.

Senator GOLDWATER. The proposed F-15's then really do not take care of your problems, do they?

INTERDICTION

General SMITH. They don't totally take care of the problem; they don't have quite the range of the F-111. If you put the F-15E, the derivative would be the F-15E, I think you would want to base it in Central Europe rather than in England in order to get a little bit closer to the fight.

[Slide deleted.]

A little bit, sir, on the type of targets you have to hit with interdiction—you are very familiar with this—we have three types of targets: Large targets with general-purpose bombs, bridges; point targets you can hit with laser-guided bombs; then you are going to go against specific, individual trucks or tanks where you need something even more accurate than the laser-guided bombs, and that is when you need a Maverick.

For the interdiction role you need a whole range of those kinds of weapons to do the job well.

Senator GOLDWATER. Keeping in mind the role of interdiction, which I have to think is one of the most important roles we have early in the war, what would be the average distance those targets would be inside of Russia?

General SMITH. Inside enemy territory?

Senator GOLDWATER. I am talking about the time to the target, the distance of the target. Forget the bridges, factories, and so forth.

General SMITH. Let me have the map of Europe. I can give you a good feeling for the good interdiction targets you would be going against.

Here are forces on the [deleted].

As far as your command and control centers and main division headquarters and those kinds of things, the key targets, most of those are [deleted, indicating on map].

If you can have an aircraft that can range at least as far as [deleted] you would cover most of the interdiction targets.

In Southwest Asia the problems are larger because the distances are greater.

Now, I would like to shift to close air support, which is another important tactical job.

[Slide deleted.]

In the situation in Southwest Asia, we think in terms of perhaps a close air support mission where you fly perhaps 300 or 400 miles. You can do that. An A-10 can handle that, deliver ordnance and get home. The trouble is because the A-10 is not a very speedy aircraft, the opportunity to fly four or five or six sorties a day, which you want to do in close air support, is limited because of the time and distance problem you have.

If you wanted to, you could fly our A-10 off forward bases [deleted] to reduce the time to and from the target.

Senator GOLDWATER. What is your average distance that you would have to travel?

General SMITH. In this case, if we had to operate out of [deleted] we are thinking of 300 to 400 miles for close air support. That is pretty long range. You can do it without refueling but it is a pretty long range for that aircraft. In Europe it is easier and I would like to point out there are, of course, four operating locations for A-10's [deleted].

In the case of Ahlhorn, which I have visited a number of times, we are really only talking 100 miles here, or less, depending on where the line of attack is. As a result of that you could easily conceive of getting four or five sorties a day out of aircraft from Ahlhorn, Sembach or Wiesbaden. As far as time/distance is concerned, the European scenario is not so difficult as far as close air support.

[Slide deleted.]

Now, to get to counter air, which is a third and also very important mission, in order to do counter air, well, you have not only to shoot airplanes down in the air but also drop bombs on the airfields. It requires the F-111 type airplanes to hit the airfields and keep them harassed and in a difficult situation as well as aircraft like the F-15 out of Bitburg.

The combination of those two jobs does the counter air job and that is terribly important because we have to maintain air superiority over the battlefield or we will clearly lose the land war in Europe.

Senator GOLDWATER. Your F-111 has a radius of about 1,200 miles?

General SMITH. That is a good, high radius, sir. When you start getting down low, your radius would drop down to about 600 miles if you had to do a lot of work at low altitude. As you can see, from Upper Heyford you can [deleted]; you can hit targets well [deleted] with the F-111; even some of the leg would be at low altitude. That really is a long-legged airplane and does a magnificient job of counter air and interdiction.

Senator GOLDWATER. You would use a high-low profile?

General SMITH. You would use a high-low profile. You climb out of Heyford and you start descending when you are across the Dutch-German border, so that you are at low altitude when you hit

[deleted]. When you leave the target area you start your climb back to the United Kingdom.

Now, to perform counter air missions in Southwest Asia, again the main point here is if you are going to do that job you are going to need long-legged airplanes to do it. If you are fighting in northern Iran you are probably going to do a little forward basing for aircraft like the F-15 in order for them to have some time over the battlefield area or near it, to do the defensive counter air.

Senator GOLDWATER. Would you move some F-111's to [deleted].

General SMITH. No, sir. I would operate the F-111 out of bases back in the [deleted] but we would have forward-deployed units, perhaps not a full squadron but detachments of the F-15 into [deleted] in order to do that job.

Now, where are we today? The total number of TAC fighter wings is [deleted] at the moment; that is based on a TAC fighter wing of 72 aircraft, so we have been building toward 40 wings since 1975, but we are not there yet. The present situation shows [deleted] in the Pacific area, [deleted] in the CONUS, including the Guard and the Reserve forces, and then slightly over [deleted] fighter wings in Europe. That is the present breakdown as we see it as of today.

Senator BYRD. How many Guard and Reserve?

General SMITH. The total of Guard and Reserve units is [deleted] about 12 wings. Of course, they are divided in squadrons all over the country. You have basically 12 Air National Guard and Air Force Reserve, and about 24 active units. That is the breakdown.

I will show you what we will have as we project for the future.

Senator GOLDWATER. Just quickly, how many Reserve and Guard units could help you on interdiction?

General SMITH. The ones that could help you in interdiction would be A-7's and F-4's. If you want a number, maybe I can get some help.

Colonel BROWN. Right now we have about [deleted]. All of those A-7 units would be able to help us provide close air support and interdiction.

Today, in the F-4 community in the Guard and the Reserves we probably have in the neighborhood of [deleted] F-4 aircraft, which is approximately [deleted] squadrons also. Again, those aircraft will be doing interdiction and also close air support. Additionally, they will be helping out in the counter-air war.

F-4'S PER SQUADRON IN THE GUARD

Senator GOLDWATER. What is the average number of F-4's per squadron in the Guard?

Colonel BROWN. Most of them are 18 to the squadron.

Senator GOLDWATER. Eighteen to a squadron?

Colonel BROWN. Yes, sir.

Senator GOLDWATER. Thank you.

General SMITH. As we look over here, [slide deleted] to show you what our goal is for 1990, established by the Secretary of Defense, that is a goal of 44 TAC fighter wings by 1990, and the distribution of those wings would be as follows: A large buildup in the States to almost [deleted] wings in the States, counting Reserve and Guard,

with [deleted] in the Pacific, a little bit more than we have today but slightly more, and a little bit more in Europe, about [deleted]. That is how the breakout would be as we forecast it today by 1990.

If we continue to get full support for our fighter procurement program, we can reach 44 TAC fighter wings by the first quarter of 1990.

Senator GOLDWATER. We have a little problem in arithmetic.

You want to have 44 wings by 1990. At the present rate of purchasing aircraft with the attrition rate, how are we going to get five more squadrons when we are not buying enough aircraft to increase our strength?

General SMITH. That is an excellent question. As we forecast the procurement rate of fighter aircraft in the next few years, we can reach 44 fighter wings, but the only way we can do that is by not phasing out some of the other airplanes. As a result, the age of the fighter force will get older. Where it runs a little over 8 years today, by 1990 it will be a little over 10 years. We feel that about the right age for a fighter on the average is 9 to 10 years.

We would like to be better than that, but on the average 9 to 10 years. If you have fighters averaging 9 to 10 years, you have a lot of them out there that are 18 and 19 years old. We have that situation today. We will have more of a problem in 1990.

We feel that by building slowly toward a goal of 44 TAC fighter wings and beginning to ramp up our fighter procurement in the out years, we will be able to get the 44 TAC fighter wings and be able to sustain that. Whether we will be able to go beyond that or not is a relative question, but we think we can make 44 wings.

We think it is prudent to set that as a goal for ourselves.

Senator GOLDWATER. I flew the F-106 in the 1950's and the F-4 in the late 1950's.

Another thing that bothers me is that the Soviets have a very decided advantage over us now. Are they liable to wait for us to get the 44 wings? Aren't they getting into a position to be able to blackmail us?

General SMITH. Yes, sir, that is a real concern that we have in the sense that our building is very slow and their building is faster; they are a more modern force; they will remain a more modern force. With all we are doing, we don't feel we can build up faster than that.

The 106, by the way, will phase completely out of the active inventory in the next 2 or 3 years.

The F-15 has gone into the first squadron down at Langley this year and those 106's are beginning to fade out of the inventory.

Senator GOLDWATER. We produce a tactical aircraft about every 3 days or 2½ days?

Colonel BROWN. No, sir, we are producing right now roughly about 500 TAC aircraft and that is an average per year. That is including the Air Force and the Navy. It turns out to be probably 1.5 aircraft every day.

General SMITH. As far as the Air Force is concerned, it is less than one aircraft per day.

Senator GOLDWATER. And the Russians produce one every 7 hours?

Colonel BROWN. They produced 1,300 for the last year and the preceding 4 years they averaged 1,300. Divided by 365, that would be 3.5 aircraft per day.

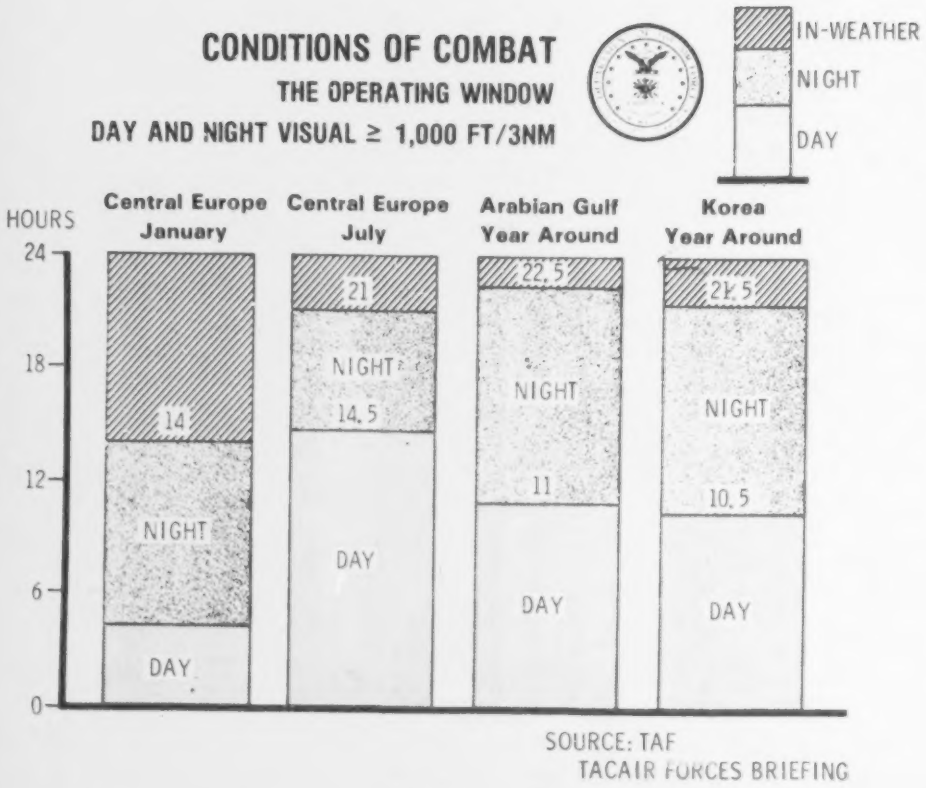
General SMITH. That is about right. Your figure of one every 7 hours is right. They are outproducing us. That allows them to maintain a very modern force, very young force, and a very capable force.

LIMITATIONS

The fighter force is limited in:
Getting to the conflict: Dependency on air refueling.
Getting to the target: Range payload.
Operating around the clock: Night; In weather.
Sustaining the force through the conflict: Fuel; Munitions; Base Support.

As far as our limitations are concerned—you are familiar with this—we have to get to the conflict. Although we have conformal tanks on the F-15 and they are much longer legged aircraft then we have seen before, we still need the air refueling. We have to get to the targets, so we need range payload. That is a concern in long distances. We have to operate around the clock, at night, and in weather.

I think you have seen this slide before, but it gives you a little bit of a feeling of where our weaknesses are. We are good in the day area but we don't have much day particularly in central Europe in the middle of the winter. We have a big night window where there are opportunities at night; the weather is good at night and we have not been able to exploit night very much. That is why we have programs like Lantirn in order to exploit the night.



In addition, of course, we want to get more allweather capability. That is a more difficult problem. It is particularly a severe problem in central Europe in the wintertime, but it is another problem we have to deal with. Right now we are concentrating a lot of our effort trying to close the night window. The Soviets do a lot of work at night, both on the ground and in the air. If we can harass them, if we can give them a difficult time at night, it means they will be much less well prepared to enter the battle the next day.

Senator GOLDWATER. This will be an interesting statistic for the record. Over the European battlefields what percetage would be VFR and what percentage would be IFR?

General SMITH. This would show it fairly well, I think. That would be somewhere in the neighborhood of 55 percent VFR even in the wintertime; however, so much of that is at night.

Talking about day, you are talking down here about 20 to 25 percent. If you took it over a complete year cycle in Europe, then your percentage would go up a little and you get a lot of daytime in the summertime and quite a bit of VFR weather. You still would average no more than perhaps 35 percent or so.

A lot of night VFR and, of course, quite a bit of weather.

Senator GOLDWATER. With the force in Saudi Arabia you would be flying mostly VFR, would you not?

General SMITH. Yes, sir, the problem we have, of course, is trying to develop a force structure that meets the requirements across many theaters. The most demanding, clearly, as far as weather is concerned, is Europe. The most demanding as far as range is concerned is clearly Southwest Asia.

Finally, in my last slide, [slide deleted] to show you what we have in mind for today, today we have increased capability of our present force, readiness and sustainability. We are doing a lot in that area.

We are buying three times as much munitions in 1983 as we did in 1980. We are doing a heck of a lot as far as flying hours, training munitions, spare parts, POL, and so forth.

As far as our force structure is concerned, we are trying to make it very, very strong.

Then, of course, in the near term we also want to continue to increase F-15's and F-16's to reach the 40 TAC fighter wing goal in 1985 and also procure a derivative fighter, either the F-15E or the F-16E, to augment our F-111 and grow to 44 TAC fighter wings.

In the long term—and we have to get started pretty soon now—there is the advanced TAC fighter aircraft to be IOC in the 1990's to meet the threat environments that we would face in those years.

Senator GOLDWATER. Is any work being done on a new TAC fighter?

General SMITH. Yes, sir, there is. Perhaps General Russ would be better equipped to handle that.

Would you like to wait until his presentation on that, sir?

Senator GOLDWATER. Yes; I will wait.

General SMITH. That completes my briefing, sir.

Senator GOLDWATER. Senator Byrd?

Senator BYRD. No questions, Mr. Chairman.

Senator GOLDWATER. General Russ, you may proceed.

STATEMENT OF MAJ. GEN. ROBERT D. RUSS, USAF, DIRECTOR OF OPERATIONAL REQUIREMENTS, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR R.D. & A., DEPARTMENT OF THE AIR FORCE

General RUSS. Sir, in covering the research and development and the procurement programs for the U.S. Air Force, I would like to first cover a little bit about strategic air defense forces, then our fighter attack forces, and then touch a little bit on our other tactical forces before I get into each of the individual programs.

OVERVIEW

Strategic air defense forces.
Fighter/attack forces.
Other tactical forces.
Programs.

This is kind of putting it all together. When I get down here I will talk about A-10's, F-15's and F-16's.

STRATEGIC AIR DEFENSE FORCES

General RUSS. Let me start off first with the strategic air defense forces. By the end of this year, fiscal year 1982, we will have three types of fighter airplanes in our air defense forces—F-15, F-4 and F-106. They will be divided into 15 squadrons, with a total of some [deleted] airplanes. Two-thirds of them, or 10 squadrons, will be in the Air National Guard and 5 squadrons in the Active forces.

As General Smith mentioned, the first F-15 squadron enters the Active Force this year and will be stationed at Langley Air Force Base, Va.

This will also be one of our antisatellite squadrons.

Senator GOLDWATER. The F-106's are going out in the next few years?

General RUSS. Yes, sir. I am going to discuss that right now, sir.

STRATEGIC AIR DEFENSE FORCES

Force objectives.—Improve warning and surveillance and Modernize air defense fighters.

Modernization plan.—Procure additional E-3A aircraft, replace 4 F-106 squadrons (active) with F-15s, and Replace 2 F-106 squadrons (reserve) with F-16s.

When we laid out the 5-year plan for our strategic air defense forces, we had two objectives: First, to improve our warning and surveillance. To do that we are procuring 12 additional E-3A aircraft. Second, to modernize our air defense fighters. To do that, we are replacing our F-106 aircraft with F-15's and F-16's.

This is what this is going to look like. By 1987 we will have replaced all of the F-106's in the active force with F-15's and we will have replaced two of the F-106 squadrons in the Air National Guard with F-16's.

If I would move that 1 year later to 1988, these last three squadrons will be gone, and the aged F-106's will be out of the inventory by 1988.

FIGHTER ATTACK FORCES

Moving now to the fighter and attack forces, currently we have seven different types of aircraft within the inventory. They are broken out as indicated here. Again, the Guard and the Reserve are a substantial part of our total force, about 34 percent in the TAC fighter area.

When you look at that force and break it down into what do those airplanes do, you will find that 55 percent are specialized.

This dashed section here is all specialized aircraft. By that I mean they are dedicated to either the air-to-surface mission, F-III, A-10, A-7 and 105, or to the air-to-air mission, the F-15. The other portion of the force is what we call dual-role and swing.

Dual role by definition is a two-seat airplane that is capable of doing all of the various functions and all of the various roles that we envision TAC, fighters do. It can do laser-guided bombing; it can do conventional bombing it can do strike with nuclear bombs; it can do air to air. It can do multiple roles because it has a two-man crew who can task share and can be trained to do more than a single pilot.

On the other hand, the F-16 can do a lot of those tasks but it can't do all of them. You only have one crew member and because of the amount of training you can give one crew member, you don't have the same flexibility. I make that distinction because as we get into the F-15E and F-16E discussion, we will be talking about an airplane to replace some of these dual-role F-4s.

Senator GOLDWATER. What percentage of your F-15A's and F15-B's will be two-seaters?

General RUSS. In the current buy, in every 24-airplane squadron we have 2 two-seat airplanes. But when we go to a derivative airplane, to replace F-4's, the whole squadron will be two-seater airplanes.

Senator GOLDWATER. What effect does that have on its intercept capabilities? Does the single-seat change the fighter characteristics?

General RUSS. No, sir. The inherent air-to-air capability in the airplane will be maintained; there will be no basic structural changes to the airplane that will inhibit the air-to-air capability: we will still retain the superior air-to-air capability that we have today.

Senator GOLDWATER. Is it just as good?

General RUSS. Yes, sir.

Senator GOLDWATER. You have found that in actual experience?

General RUSS. We haven't built one of those.

Senator GOLDWATER. Take the trainer——

General SMITH. As I mentioned, I flew the F-15 for 3½ years; I flew a lot of B models and D models, two-seaters as well as single-seaters. When you get in an air-to-air fight you can't tell the difference between the two airplanes. It is the first time I have been in a two-seater that had the same basic performance as the single-seater. It is a little heavier but you have so much thrust and energy and so much G capability, you really can't tell the difference. .

When we go to the E model it will retain that inherent, very fine air-to-air capability.

Senator GOLDWATER. That is a concern to me because we have only developed two air-to-ground support aircraft, but we have changed the characteristics of a lot of good interceptor fighters to make ground attack aircraft out of them. I would hate to see a bird like the F-15 or F-16 lose that superior capability which we have to keep.

General SMITH. That is a concern, sir, and we have to watch that very carefully. I think we can do it in the case of the F-15 because, as I mentioned, the D model is a fine performer. If we load it up with a lot of extra stuff we could hurt that airplane.

Fortunately, the technology is coming along now when you can put more things in the airplane without adding anything significantly to the weight. As a result, I think we will be able to turn that E into a fine long-distance interdiction airplane while retaining the full air-to-air capabilty that we have in the B and D models.

A-15 AND A-16

Senator GOLDWATER. I have heard that argument all my life. I hope you will encourage your pilots to tell you when they think we have reached the point that the aircraft is no longer dual capable. We cannot lose that air superiority characteristic. I think we have it now.

I believe that the F-16 probably the F-15 are superior to anything the Russians have in the air. I would encourage the young

pilots to talk to the brass and let you know what they think. I get different interpretations.

General SMITH. That is a fair point. We really need to keep an eye on that because we don't want to screw up a great airplane.

Senator GOLDWATER. Thank you.

FIGHTER/ATTACK FORCE OBJECTIVES

Increase readiness and sustainability of current forces
Improve capability of current forces
Build to authorized force level
Prepare for future needs

General RUSS. In laying out our 5-year plan for our TAC fighter forces we developed these four force objectives; General Smith has mentioned a little bit about them. Let me just go through each one and show you what we are doing for the fighter force.

Starting off with our readiness and sustainability, we think that is the most important need and we will take care of that first.

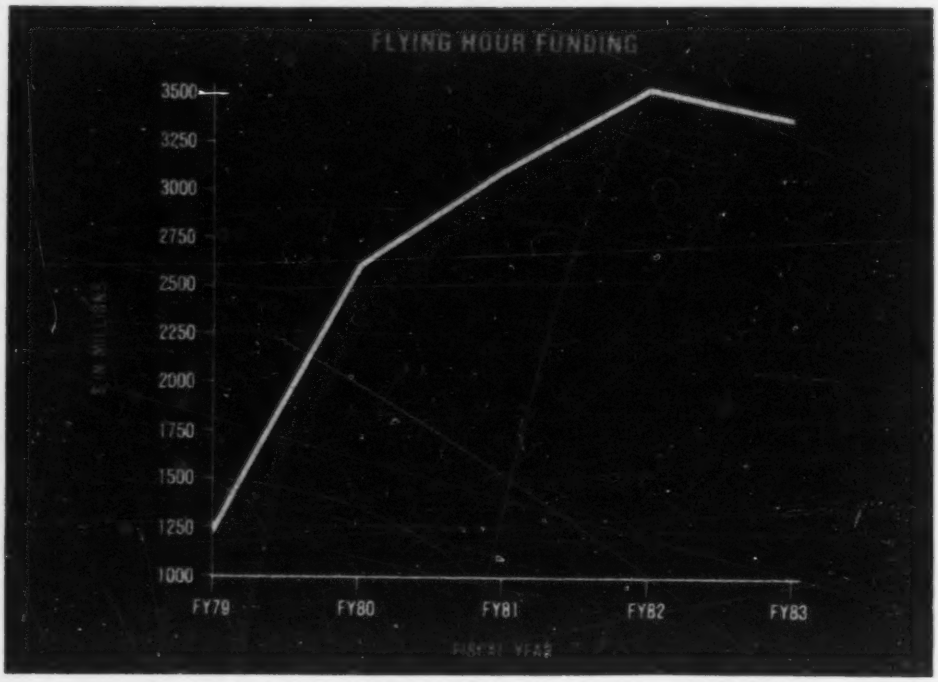
Then we want to improve the capability of our current force. Next, we want to then build to our authorized force structure; and then we must be prepared to look where we are going to be in the 1990's and plan for our future needs.

Senator GOLDWATER. Will the new F-16 fit into that program?

General RUSS. Yes, sir, it will.

READINESS AND SUSTAINABILITY

I have a couple of charts later to show you exactly where we are going, and we will look at the F-15E and F-16E and where they fit into the force structure.

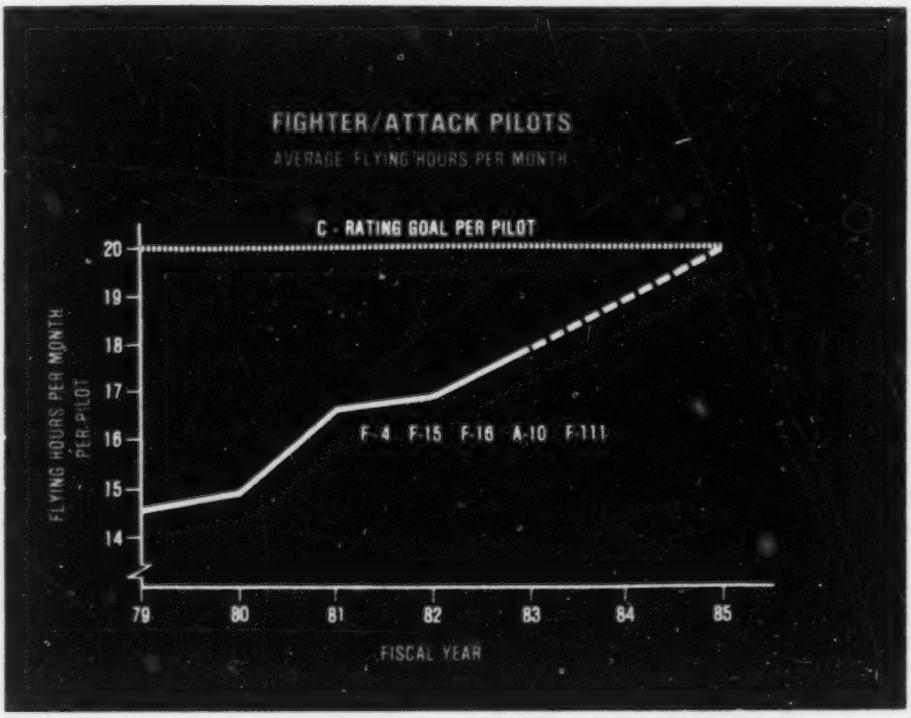


Starting with readiness and sustainability, I think one of the prime indicators of readiness is flying hours. You know how important it is to have pilots flying and getting sufficient hours; therefore, in the last few years we have increased significantly the amount of dollars that we put into the flying hour program.

This shows where we were in 1979 and it shows the dramatic increase in funding for flying hours. This drop here is kind of an anomaly; it is the first time that the cost of fuel has dropped. That is what that reflects there. It does not reflect any decrease in the amount of effort.

AVERAGE PILOT HOURS

Senator GOLDWATER. What are we talking about in average pilot hours now?



General RUSS. This chart shows the average pilot flying hours per month. Back in 1979 we were very concerned about this problem, and averaged about 14.5 hours. We have been able with increased funding to continue to increase our program and we hope by the end of 1983 we will average slightly under 18 hours.

Senator GOLDWATER. Per month?

General RUSS. Yes, sir. With the goal of approximately 20 hours. You know and I know that you can't put something as complicated as flying hours for different airplanes all in one chart. I have tried to do this to make it simple, but you know the A-10 flies about 22 hours a month and the F-111 flies less than 20 hours. I tried to average it to be able to give a feel of where we are in the total pic-

ture. We are not there yet. We still have to get up here to get the maximum out of the airplanes and the aircrews.

Senator BYRD. How does the 20 hours you are speaking of compare with, say, 10 years ago?

General RUSS. We have been on a continual decreasing spiral since about the Southeast Asia timeframe. We got down to the point where we were averaging some 12 or 13 hours per month. If I continued that curve, Senator Byrd, it would come back up like this. Back some 15 years ago we were flying 20 to 23 hours a month per crew.

After Southeast Asia it went straight down.

Senator BYRD. You feel 20 hours is the appropriate number?

General RUSS. I think 20 hours is a good measure, but you have to determine what you are doing with that 20 hours. When I say 20 hours I mean 20 hours of good training. The type of training we have nowadays such as Red Flag and Maple Flag is much more useful than some of the training we did previously. You have to determine what are the systems on the airplane and, as General Smith will say, he has laid out different requirements for each one of those airplanes, so they are not all the same.

I know I have oversimplified this somewhat, but I think it is useful to be able to see where we are when someone asks that question.

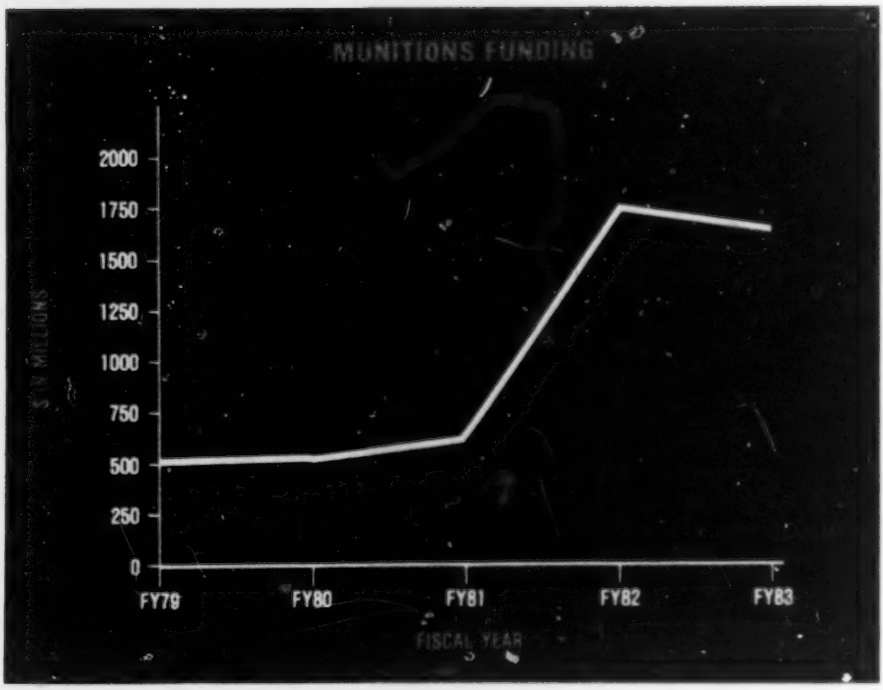
General SMITH. There is a system called the GCC system. By 1985 we will have all our fighters in TAC forces flying what is called the GCC level 3, which means fully mission capable.

In the case of the A-10 it may be 22.5 hours. In the case of the F-4 it may be 17 hours, but it allows all the pilots to be fully mission capable across the whole spectrum of missions. We are not there yet but we have a goal and we will make it by 1985 if we continue to fly the hours as we plan to do.

Senator GOLDWATER. I wish you would get that message out to the troops. A lot of them were complaining to me about what they hear, that they are going to cut down on flying hours. You know, if a man does not fly he is very unhappy.

General SMITH. Yes, sir. The problem we have is that although we have put some good money and effort in there, the people out in the field are still not flying enough because it takes so long to buy the spare parts and those kinds of things.

They want it right now; they want that 20-hour rate now. As you can see, it will be a while before we get it. We are trying to get the message out. The morale is going up. Retention in the pilot corps is going up very nicely; but unless we deliver the credibility will go way down. We have to sustain the program and continue to build with it.



General Russ. Looking at the sustainability area, let me discuss munitions funding. In 1979, 1980, and 1981, we had stable funding but we had a bowwave. What we are trying to do is eliminate that bowwave in 1982 and 1983 and get up to the sustaining level.

In the air-to-air missile area, back in 1981 we had only about [deleted] percent of our requirements. Through the help of Congress we were able to continue to add funds to that area. By [deleted] we will have [deleted] percent of our requirements funded. Again this chart is a summary chart and I will show you later specifically how we are doing on AIM-7, AIM-9, and AMRAAM.

Senator Goldwater. General Smith, is it true that a few years ago we only averaged about [deleted] air-to-air missiles per aircraft in Europe?

General Smith. Yes, sir. When I was a wing commander in Bitburg we would have run out of missiles on the end of the [deleted] day of the war. We only had [deleted] missiles per aircraft; however, I just checked on Bitburg last week; there are [deleted] air-to-air missiles.

Senator Goldwater. How many aircraft do you have?

General Smith. We have 80 total, but it is 72 PAA combat aircraft, so you are now talking about [deleted] missiles per aircraft. That [deleted] it is a dramatic improvement over what it was 3 years ago when I commanded the wing.

Senator Goldwater. You still have only [deleted] sorties?

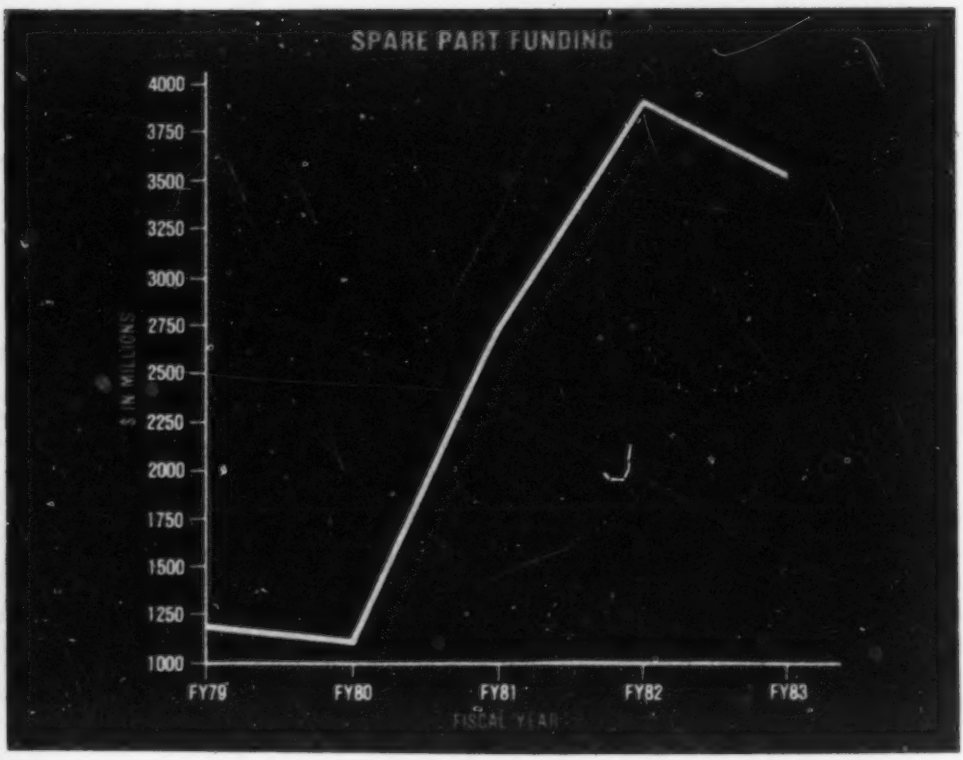
General Smith. It would depend on your expenditure rate per sortie. We figured you would expend somewhere in the neighborhood of [deleted] per sortie. As a result of that, if you had 50 per aircraft you would still only last, depending on the threat, [deleted]

so you [deleted]. I am not saying you do. You can see by that we still have a way to go, but at least the situation has improved a lot.

We are finally beginning to get enough direction in area munitions. We are not as good in preferred munitions air-to-ground.

General RUSS. The other half of the munitions picture is the antiarmor munitions. What this chart says is that in [deleted] we had [deleted] percent of the munitions that we needed for [deleted] days; however, the majority of those munitions were substitute munitions or World War II iron bombs. We had very few [deleted]—some of our smarter munitions such as laser bombs and Maverick.

[Deleted]. We will be in much better shape in the next few years.



Spare parts funding is another critical area and directly related to our flying hours. You can see the tremendous increase in spare parts funding that we made in 1981 and 1982.

Again, we were trying to catch up.

Senator GOLDWATER. I have a question that might not be related, but I think it is important: We depend on foreign sources for about 63 percent of our strategic metals, including all of the metals that go into the manufacture of stainless steel or the augmenting of titanium. Now, how are we fixed on spares that depend on titanium or stainless steel? I am thinking of items such as nose wheel struts.

General RUSS. We do depend on foreign sources for materials, sir. It could be critical if our supplies were interrupted. We have certain stockpiles that allow us to go for a period of time. I don't recall exactly how long that is. That is a very good point.

We do rely on foreign countries for a lot of our materials.

Senator GOLDWATER. I am thinking right now, for example, of how difficult it is for you to maintain a proper inventory. Let us take the nose wheel strut of an F-15, do you have enough now in your spares?

General RUSS. We have enough material and we have enough money in our budget, and we have enough capacity in our industry to build to the levels that we need; however, we are short on capability to surge. If we wanted to increase our output fast and expand like we did in World War II, we would be hard pressed to do that.

Sir, as you know, spare parts fall into three categories: The first is our peacetime operating supplies, those spare parts we use for day-to-day flying. That has dramatically increased and is fully funded in 1983.

The second is our war readiness support kits and base level support kits, by definition the supplies required to take us through the first 30 days of war. Again, they are [deleted] funded. And to take us out to the next 30 days of war or out to the 60-day area, we need our other war readiness material. This OWRM will be [deleted].

We could produce parts a little faster than that, but not much.

FIGHTER/ATTACK: FORCE OBJECTIVES

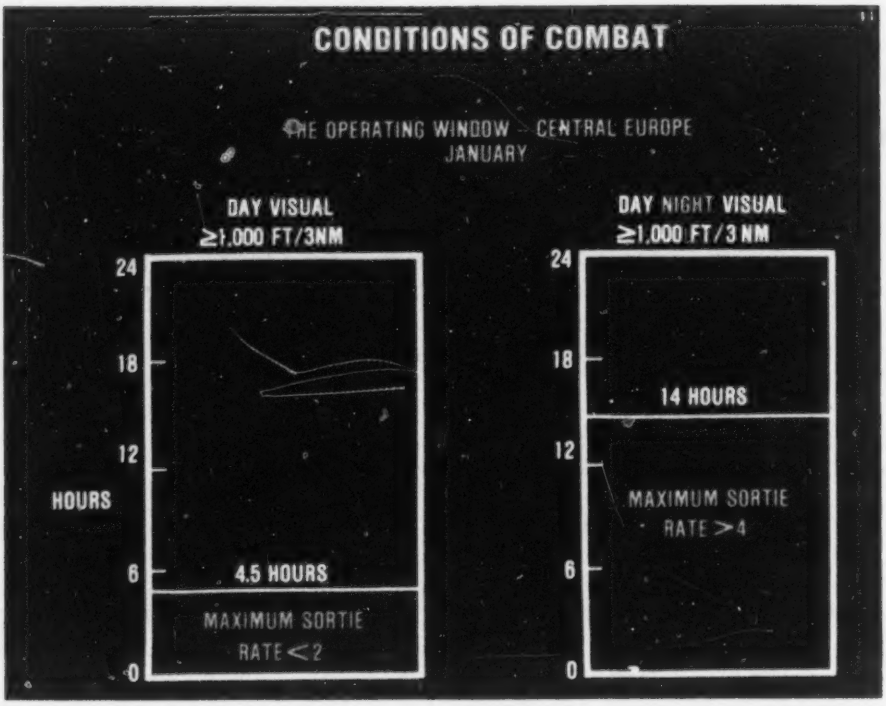
Increase readiness and sustainability of current forces.
Improve capability of current forces.
Build to authorized force level.
Prepare for future needs.

The second area that I would like to discuss is now we are going to improve the capability of our current force. In doing that, I have picked two areas which I think are most important.

AMRAAM AND LANTIRN

The No. 1 air-to-air requirement for the TAC Air Force is to build and field an advanced medium-range air-to-air missile.

The No. 1 air-to-surface requirement is to equip the F-16's and A-10's with Lantirn pods which will give us a night window.



General Smith mentioned this. I just bring it up again to emphasize the importance of that night window. You saw this chart but again let me briefly run through it:

In January in Central Europe with day VFR fighters we can only fly two sorties a day however, if we give that force night window, give it a Lantirn capability, we can double the capability of that force.

Senator GOLDWATER. Lantirn is going to be rather difficult part of the whole program. I may be wrong in this, but I think that it amounts to about $6 million a cockpit. Is that correct?

General RUSS. In then-year dollars the figure is approximately $6 million—I sometimes have a difficult time with that and the reason I do is because I have a difficult time understanding then-year dollars.

As an illustration, my wife came home the other day and said lettuce was $1.25 a head. She can't even think in now-year dollars because she doesn't believe lettuce can be $1.25 a head. Most of us have difficulty thinking in then-year dollars. However, in then-year dollars $6 million is a correct figure. If we use base-year dollars we are down to about $2 million, which is the way we like to manage the program.

Senator GOLDWATER. Are you working on any other system or with any other manufacturer to bring that cost down?

General RUSS. Right now we are looking at a program that invokes a second contractor, where we could compete the procurement. I talked to General Creech yesterday and he believes that a variant of the F-18 FLIR pod, if developed, could be available for competition. We would then have a choice before we went into pro-

duction for the TIRN pod. The navigation pod is going along fine and we would continue with that.

So, to answer your question, we are working possible ways to keep the cost down.

SORTIES FLOWN AT NIGHT

Senator GOLDWATER. What percentage of your sorties on the European battleground will be flown at night?

General SMITH. Once you have a night capability, once you have an ability to do something at night, I think your sorties at night would be about the same as they would be in the daytime. Until you get that capability, of course, most of the sorties would be in the daytime.

The one area where you would [deleted]. Counter air missions and interdication missions, you would do as much at night as in the daytime.

General RUSS. Let me show you the next chart. [Slide deleted.] Right now, the [deleted]. When we get the Lantirn system we open the night under weather window and we have this sort of capability that can operate at night. You still see almost two-thirds of the pie with only a day capability, so I would think a good percentage of these fighters will be flying just at night, because that will allow us to have around-the-clock capability.

Senator GOLDWATER. Do you have any Lantirn's flying yet?

General Russ. No, sir.

Senator GOLDWATER. Have you tested any?

General RUSS. Yes, we have tested various components. We have tested the radar. We have tested the FLIR components and we have tested the laser, so a lot of the components in the Lantirn program have been tested individually. Some of the components are from other programs like the PAVE TACK program where we have used some of the FLIR components.

Senator GOLDWATER. Have you tested any in an aircraft?

General RUSS. We have tested the terrain-following radar in an aircraft and we have tested some of the FLIR's from airborne systems, but we have not packaged it all together yet, sir.

Senator GOLDWATER. I am just talking about the ability of the pilot to look at a target, identify the target, and latch on.

General RUSS. We have a simulator that we have developed that allows us——

Senator GOLDWATER. That is not the question. I want to know if this aircraft will perform up there.

General RUSS. We believe it will. But we have not put it all together yet, sir. The individual parts work; it is a matter of integration.

Senator GOLDWATER. When do you think it will be ready to fly?

General RUSS. The Lantirn navigation pod will begin flight test activity in July, followed by Lantirn targeting pod flight tests in December 1983.

Senator GOLDWATER. How long has that been in development now?

General RUSS. About 2 years.

Senator GOLDWATER. It is longer than that.

General RUSS. Maybe 3 years. I don't recall when we first started.

Senator GOLDWATER. I remember attending a meeting on this in Florida; I think it was 2 years ago. They were quite well along at that time.

General RUSS. I became acquainted with the program when I got to the Pentagon a little less than 3 years ago. They were just getting off the ground then. I would say 2½ to 3 years.

Senator GOLDWATER. One more question. This Lantirn is not going to be an easy thing to get through. It is a terribly expensive addition to a fighter. If we go into conference and start talking about fighters costing over $30 million apiece with one pilot, adding $6 million, that is not going to be easy. What could happen to your force if you didn't have the Lantirn?

General RUSS. Sir, when we look at the threat, as I know you have, the Russians' equipment allows them to fight at night; if we can't it will give them a sanctuary. We just don't have anything to fight at night.

I don't believe it is prudent to have a day VFR fighter force and give the enemy the capability to fight around the clock. I don't know what we would do. We would be in the same situation we were in during the Battle of the Bulge the first 2 weeks, when we had negligible air because of the weather situation. We would have the same situation now at night. It is expensive but I think the increased capability that it gives us is worth the money.

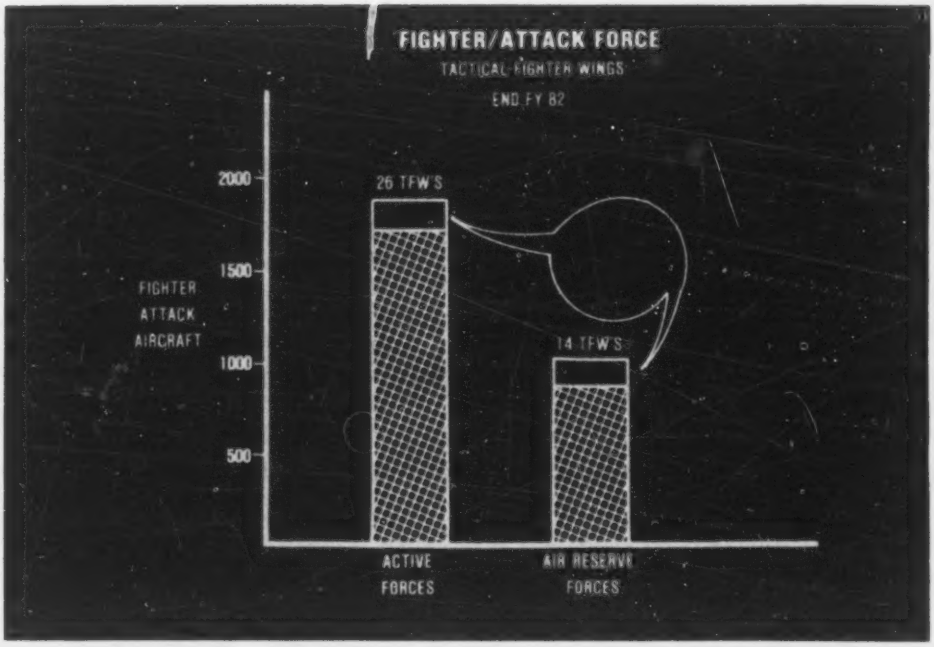
I mentioned the AMRAAM as the No. 1 priority air-to-air program for the TAC air forces. To show you why that is needed, currently about [deleted] percent of our force has an [deleted]. The problem, of course, is with the F-16. It [deleted] on it; therefore, the AMRAAM will not only go on the F-15 but will also go on the F-16 and give us an increased capability on the F-16.

It is important to note that in our discussion on F-16's going into the air defense forces, we would include AMRAAM's on those airplanes because it would [deleted].

FIGHTER/ATTACK: FORCE OBJECTIVES

Increase readiness and sustainability of current forces.
Improve capability of current forces.
Build to authorized force level.
Prepare for future needs.

My third area, sir, is to build to our authorized force level. By the end of 1982 we are authorized 26 TAC fighter wings in the Active Force and 14 TAC fighter wings in the Reserve Forces; however, we are short airplanes. We do not have enough airplanes to flesh out those 40 TAC fighter wings.



When you add those airplanes all up, the shortage equates to four TAC fighter wings.

FIGHTER/ATTACK AIRCRAFT PROCUREMENT

	Fiscal year					
	1982	1983	1984	1985	1986	1987
A-10	20	20	0	0	0	0
F-15	36	42	60	96	96	96
F-16	120	120	120	120	180	180
Total	176	182	180	216	276	276
Air defense	33	27	20	33	54	20

Here is what we are doing in our procurement plan, our buy is A-10's, F-15's, F-16's, in the quantities indicated. The A-10 buy will be completed in 1983. Our F-15 buy will build to 96 a year by 1985. We have a 4-year multiyear contract with the F-16 at 120 a year, and after that time we would move to 180. These are the numbers of total fighter procurement; however, out of those numbers must come modernization of the air defense forces and these are the approximate numbers coming out of that force. With that procurement, let's look at what that does to our force?

A-10'S

Senator GOLDWATER. Before you leave that chart, General, do you really need more A-10's?

General RUSS. Sir, the last A-10's we are buying will finish off the 727 that we planned on buying. They are the attrition air-

planes. If we did not receive those airplanes, then the force would start to attrite sooner. They are not going toward force structure.

Senator GOLDWATER. Let us say that the Congress decides not to buy any A-10's this year, and there is a good chance for that, how would you spend that $357 million that would be saved, where would you put it?

General RUSS. I have a lot of places to put it, sir.

Senator GOLDWATER. Would you buy more fighters?

General RUSS. I would like to buy more fighters. I would like to buy more F-15's and F-16's if I did not buy those.

Senator GOLDWATER. I was one of the great champions of the A-10. I think you have all you need. I know what you are up against. You have the parochial problem of Massachusetts, New York, Pennsylvania, and Maryland, all wanting to keep that A-10 going just like they bought A-7's to keep Texas happy. I think the time is coming when we are going to have to say no.

I would rather have the Air Force stand up and say we don't need them and I know that most of you think you don't need them, but you come over here to tell us you do need them just to keep some people happy.

They will be mad at me but they are mad at me anyway; it makes no difference. I don't think you need any more A-10's. It is a great airplane. I can't see it. I can tell you when it comes under my subcommittee I have no intention to recommend any further purchases.

So, if you don't want them, then do not come before the committee and say "We have to have them to do this and that."

In my opinion you don't need them.

General SMITH. If I may make a couple of points on that——

There is a lot of uncertainty in the close air support role. For instance, the Army attack helicopter is one that is under considerable scrutiny at the moment. If that should fall out of the program, then I think one could argue that a full A-10 buy up to 727 does make sense. We have also got a very strong commitment to the U.S. Army and our allies to provide close air support.

I think it is important for us in the Air Force to continue to support the allies and support the U.S. Army and show that support. We did originally forecast 733 airplanes when we first started. We are going to end at 727, so we have come pretty close to meeting that commitment.

At the present time the institution of the Air Force still supports the buy-out of the 727. Certainly there are some people who don't think we need them.

Senator GOLDWATER. Yes, but don't come over here cheering for it. You don't have to say a word. I know you don't want them.

Are the A-10's in this year's budget designated for the Guard or the Reserve or both?

General RUSS. They are designated for attrition aircraft. There are 20 airplanes in this year's budget; 14 of them would be two-seaters that would go into the training establishment; the other six would be attrition, spread among the force.

Senator GOLDWATER. Using the attrition argument, you would have them every year from now on?

General RUSS. Yes, sir. Right now they will go into the Active Force in the early 1990's; the late 1990's in the Air Reserve Forces. If you continue to buy attrition airplanes you could buy them every year.

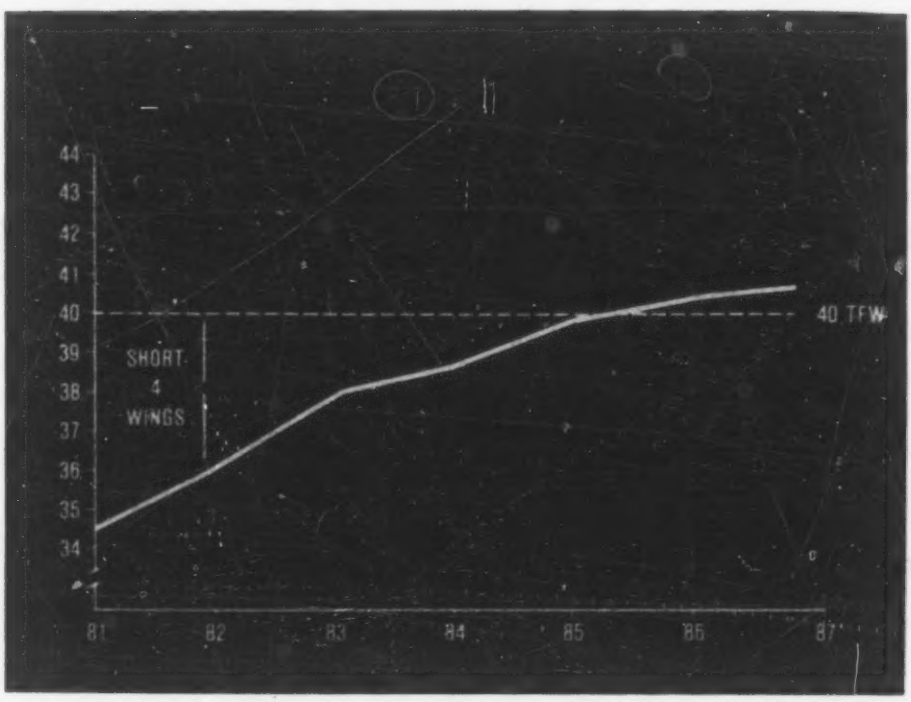
Senator GOLDWATER. I really believe we need more F-15's and F-16's. I just don't like the imbalance between the TAC forces of the Russians and ourselves, or the NATO forces. I can tell you that it is my inclination—it might even be my intention—to tell my subcommittee that I don't think we need any more A-10's.

You must look at it once in a while. Have you ever looked at airplanes and why we buy them? You wonder why we have any air power. You have a great demand now for more C-130's. We don't need more C-130's in the Guard but we have a great deal of political muscle in that part of the country and they are going to want them. So, we don't buy the things we have to have.

I don't want to be critical of the Air Force, but I think you have to put your emphasis where your thoughts are. You want more fighters. You are a tactical man, you all are, and you know for many years the strategic end of our business ran the show. Without tactical forces, face it, we are dead, and we don't have enough. I don't want to buy anything that we can't use.

Don't be shocked if you don't get A-10's.

General RUSS. Thank you, sir.



Let me show you how those aircraft, we are going to procure on the previous chart, fit within the force structure.

As you will recall, I said that at the end of this year we will be about four wings short of the 40 TAC fighter wing force. That pro-

curement will allow us to build the force until in 1985 we will have 40 TAC fighter wings and slightly above 40 tactical fighter wings by 1987, and I might say that by 1990 we will have increased that to 44 TAC fighter wings; however, that comes with a penalty. This is the point you brought up before:

The penalty is that the average age of your forces increases. General Smith has mentioned the life of a fighter is about 20 years. There are some that are a little less and some a little more. By and large, 20 years is all we expect to get out of the fighter.

That being the case, the average age should be somewhere around 9 to 10 years. That is what we shoot for.

If you look at 1983, we have about an 8.5 average age. With that growing of our force structure, that average age will increase to about 10.4 in 1987.

Now, as we build to the 44 wings, it will pretty well stabilize at 10.5. The only way to get around that is to buy more airplanes, as I mentioned before.

Now, I think it is significant to look at what our adversary is doing. [Deleted.] He has not only the quantity but also he has the quality and he has new airplanes with the latest gear in them.

FIGHTER/ATTACK FORCES

By 1987 this is where we will be. The F-105 will no longer be in the force structure; it will have been retired.

The F-16 will have been entered into the Reserve and the Air National Guard and we will have increased force with more F-15's and F-16's.

FIGHTER ATTACK: FORCE OBJECTIVES

Increase readiness and sustainability of current forces.
Improve capability of current forces.
Build to authorized force level.
Prepared for future needs.

The last point I would like to discuss is what are we doing for our future TAC force.

F-15/F-16 DERIVATIVE AIRCRAFT

As you know, the tactical commanders have identified a requirement for 400 long-range dual-role fighters to replace our aging F-4's. When I talk long range I think this chart will help. In our previous discussion this morning we talked about how many targets you can cover, and to what depth you can go.

What this chart shows is that offensive counter air targets, or to say it another way, airfield attack, that 100 percent of the airfields that are of interest, or I should say [deleted] percent of the airfields that are of interest, can be attacked by the F-111 [deleted]. Only about a little over [deleted] percent of those airfields can be attacked by the F-4.

The derivative fighter, we propose to buy, would allow us to more than [deleted] the number of airfields that we could cover with the F-4. This is the range that we think that either an F-15E or an F-16E will be able to cover, so this is where we get the point

that the derivative fighter will augment the F-111 in the deep interdiction role.

We all know it won't go as far as the F-111, but it will certainly take a big chunk out of that area in between.

So, that is the range problem.

[Slide deleted.]

The second problem is the age problem. We mentioned the 20-year age of the fighter. This chart looks at the F-4. This is every F-4 that we have in the U.S. Air Force. The average age of that F-4 by 1987 is [deleted] years, or as close to [deleted] as you can get, so what we are interested in doing is replacing a portion of those F-4's with the F-15E or F-16E.

[Slide deleted.]

This is how it fits in. Coming in in 1987, our E would start to replace some of the F-4's that will be going out of the inventory. Certainly we don't have to replace all of the F-4's with this type of airplane. We would replace some of the F-4's with F-15's and F-16's, C's and D's, the current models that we have right now.

FIGHTER/ATTACK FORCE: CONGRESSIONAL GUIDANCE

F-15E/F-16E AIRCRAFT

"The conferees deleted the Department's request for $27.3 million to begin development of the F-15E, the interdiction version of the F-15. This decision does not foreclose consideration of the F-15E. However, it does reflect congressional oppposition to the enhancement of the F-15 in an air-to-ground role prior to receiving a comprehensive explanation of the Air Force plan to meet air-to-ground requirements."

"The conferees agreed to authorize the full MSIP requirement and approved an additional $15.3 million to be applied to the flight demonstration of the F-16E. It is the understanding of the conferees that $7 million would be required to fund the F-16E flight demonstration scheduled for summer of 1982." Authorization Conference.

However, last year Congress told us to come back to them and explain where we were going in our air-to-ground game plan, and because of that they did not give us any money to develop the F-15E; however, they said that the decision does not foreclose consideration of the E. Additionally though, they did approve a flight demonstration of the F-16E, so we have prepared a briefing and it has been around to various people over on the Hill and that game plan has been developed.

FIGHTER/ATTACK FORCE—DUAL-ROLE DERIVATIVES

Conduct a comparative demonstration of F-15E and F-16E prototype.
Select one in fiscal year 1983 and initiate FSED.
Procure 400 aircraft.
Continue balanced procurement of F-15's and F-16's until availability of ATF assured.

Part of this that I am discussing today is included in that game plan, Senator. This is what the Air Force plans to do.

We want to conduct a comparative demonstration of both the F-15E and the F-16E, then we want to select one, and then we want to initiate full-scale engineering development, and then we want to procure 400.

We don't intend to procure both the F-15E and the F-16E. Whichever one we select, we will continue a balanced procurement of F-15's and F-16's until we have the ATF in the force.

As I mentioned before, to maintain a constant force level you have to continually put airplanes in, or else you attrite more per year than you buy.

Now, the ATF is the second part of what we are looking at for the future.

This year we have in the budget a line to start our advanced TAC fighter. This is our fighter of the 1990's. In addition, we have money in there to develop a joint engine with the Navy for their advanced TAC fighter.

As you know, it takes 10 to 12 years to develop a fighter. I think the A-10 took 10.8 years and the F-16 took about 12 years. If we start in 1983 with this new fighter, we wouldn't have it in the inventory before 1993 or 1995. So, we believe that it is very important that we get started on this work, so that those who come behind us will have new fighters in the next century.

Senator GOLDWATER. What would you think of the United States taking the Russian program of just constantly modernizing a basic concept, like their Mig's have been going on now since the 15, and they are up to about 28. Why couldn't we bring up a modification of the F-15 or F-16 every 2 or 3 years, if we start now?

Wouldn't we be better off?

General RUSS. We do that to some extent, not to the extent that they do, I recognize, but we do that to some extent. That was the idea with the F-15E and the F-16E, modernize those airplanes, change the wing in the F-16 but primarily avionics modernization in the F-15. About every 7 years the Russians introduce a new fighter. They will modify some but every 7 years they will come out with a new one. Their [deleted].

We are not looking at a modification of a fighter, for the new ATF. We are looking at things such as supersonic cruise. We are looking at things such as Stealth, and we are looking at things such as short-field takeoff and landing.

Now, we can do each one of those to some degree, but to put those all into a fighter and package it is going to be quite a challenge. We think this will be the new technology fighter and a step ahead of the Russians.

FIGHTER/ATTACK FORCE—SUMMARY PLAN

Today: Increase readiness and sustainability of current force.

Near term (by 1987): Improve capability of current forces by developing and fielding a night/adverse weather capability; flesh out 40 TFW's by continued procurement of F-15's and F-16's; and initiate procurement of a derivative fighter (F-15E or F-16E) to replace aging F-4's.

Long term (post 1987): Develop and procure an advanced tactical fighter to meet the 1990's threat; and continue balanced procurement of F-15's and F-16's until availability of ATF is assured.

Let me quickly summarize then what I have said on the fighter attack force. The importance of readiness and sustainability goes without question. We are going to do that today.

Senator GOLDWATER. General, go ahead. I have a phone call, but these gentlemen will listen to you.

General Russ. By [deleted]. We will have fleshed out our 40 TAC fighter wings and we will have initiated procurement of our derivative fighter, either the F-15E or the F-16E. After 1987 we will develop and produce the advanced TAC fighter while we are continuing to procure a balanced number of F-15's and F-16's until we have that ATF in the force.

OTHER TACTICAL FORCES

Some people call these cats and dogs. I like to call them rubies and gems primarily because I think that without these support forces you don't do all the things that any fighter pilot sometimes thinks we do.

So, let us spend a minute discussing them. The primary part of this circle is the RF-4C's. The next largest chunk is forward air control aircraft, then we have our specialized 130's helicopters, our jamming aircraft and, of course, our E-3A's.

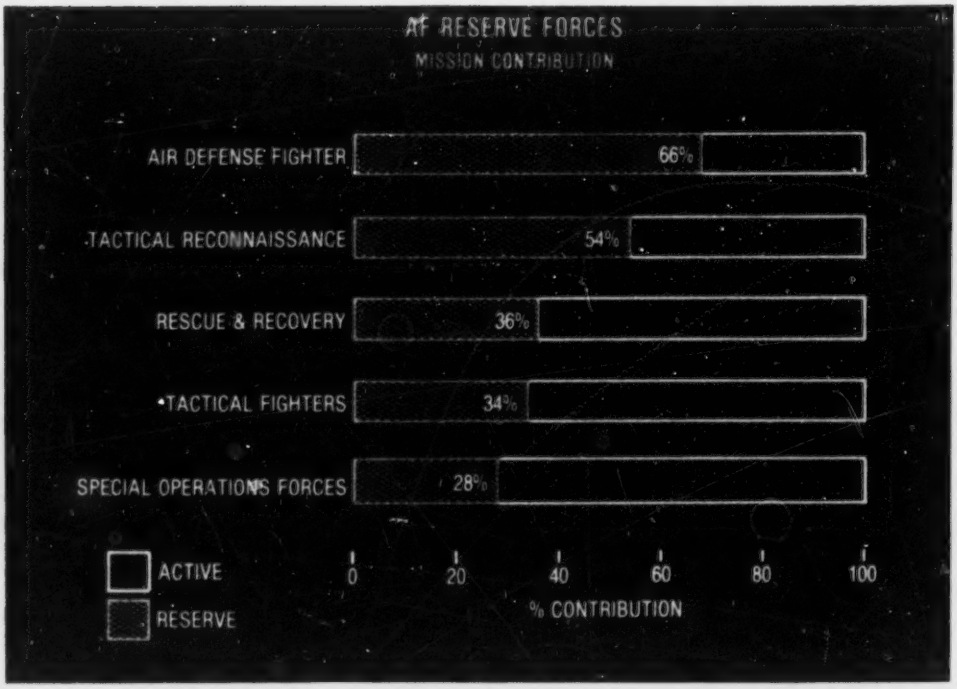
OTHER TACTICAL FORCE PROCUREMENT

	Fiscal year					
	1982	1983	1984	1985	1986	1987
E-3A	2	2	1	3	4	4
EF-111	12	9	0	0	0	0
EC-130	5	5	6	0	0	0
MC-130	0	0	2	4	6	0
UH/HH 60D	6	0	4	16	22	48

Over the 5-year period this shows the procurement. We will increase the buy of E-3A's from 34 to 46, or an additional 12 aircraft.

In 1983 we will have completed the EF-111 modification kit buy. We are buying five kits to modify 130's for the jamming role, buying more MC-130's, and we will continue with our combat helicopter modernization efforts. By 1987 then the force will not have changed drastically.

You will see up here where the E-3A and EF-111 come in, and the percentage of Reserve and Active are maintained relatively the same.



I thought it useful to summarize the Reserve contribution.

You saw those little bits and pieces on each of the circular slides. Here I have laid it our by type of mission. You will see that the Guard and the Reserve have provided the TAC forces with 66 percent of their air defense fighters, 54 percent of TAC reconnaissance, 36 percent of the rescue and recovery, 34 percent of the TAC fighters, and 28 percent of the special operations forces.

RESERVE FORCE READINESS

Training: Red flag; blue flag; maple flag, and JCS exercises.
Deployment this year: More than 300 units; and 26,000 personnel.
Competitions: Winner William Tell 1980; and Winner Gunsmoke 1981.

We think that is important, since they contribute so much and they train and deploy just like the Active Forces do. They participate in Red Flag, Blue Flag, Maple Flag, and JCS exercises. As a matter of fact, between 45 and 50 units will deploy to Red Flag this year. In 1982, more than 300 units, some 26,000 people will deploy.

I think as a kind of capstone, which the Air National Guard is quite proud of, is that the last major air-to-air competition in air defense was won by the Air National Guard, William Tell 1980. This year's competition in air-to-ground was won by the Air National Guard flying A-7's out of Denver.

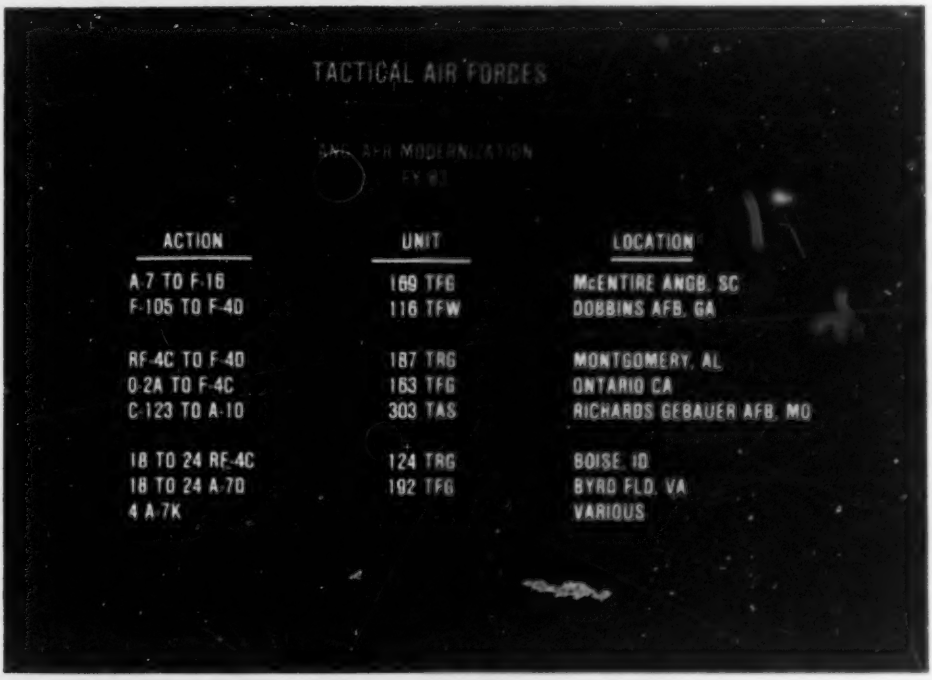
Senator GOLDWATER. That does not surprise me.

General RUSS. No, sir, it doesn't, with the type of maintenance that they have and the quality of personnel, it does not surprise me.

Senator GOLDWATER. I don't want you to think that is a reflection on the Regular Forces, because our average fighter time in the

Guard unit is two or three times greater than the average time of a regular pilot.

General Russ. We count on the Reserves and the Guard, as you well know. When they prove to us that they are ready to do that, them that makes us happy.



The last slide is to discuss modernization.

I put this up there to show what we are doing in 1983 and the way we are going with the Guard and the Reserve.

Really, we are doing three things: We are getting rid of some of the old airplanes—O–2's and 123's; those are going out. We are converting those to fighter-type aircraft. We are fleshing out the squadrons that were 18 airplanes; we are building them to 24 airplanes, and we are introducing brand new airplanes off the production line—F–16's, A–10's and A–7's, into the Guard.

Sir, that takes me down through this first section now.

TACTICAL AIR FORCES—R.D.T. & E. AND PROCUREMENT PROGRAMS

Fighter attack aircraft.
Anti-aircraft missiles.
Air-to-surface weapons.
Defense suppression/electronic warfare.
Other tactical forces.

With your permission, I would like to start into the TAC Air Force program and we will go through them one at a time.

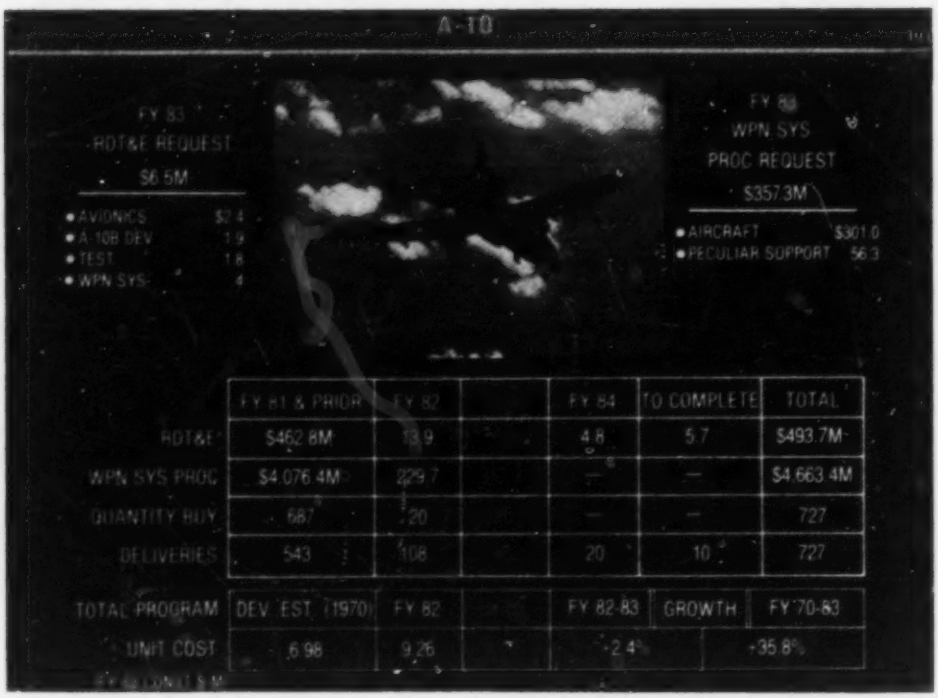
First, I would like to talk about fighter and attack aircraft.

A–10

Specialized for close air support.
Over 580 delivered to Active and Reserve Forces.

Fiscal year 1983 completes planned buy of 727 aircraft.
14 two seat training aircraft procured.

The A-10 is our specialized close air support aircraft. As I mentioned before, we have over 580 delivered to the Active and Reserve Forces. In 1983 we should complete our buy. Of that last 20, 14 of those will be two-seater planes.


A-10
FY 83
RDT&E REQUEST
$6.8M
• AVIONICS $2.4
• A-10B DEV 1.9
• TEST 1.8
• WPN SYS .4
FY 83
WPN SYS
PROC REQUEST
$357.3M
• AIRCRAFT $301.0
• PECULIAR SUPPORT 56.3
FY 81 & PRIOR | FY 82 | FY 84 | TO COMPLETE | TOTAL
RDT&E: $462.8M | 13.9 | 4.8 | 5.7 | $493.7M
WPN SYS PROC: $4,076.4M | 229.7 | — | — | $4,663.4M
QUANTITY BUY: 687 | 20 | — | — | 727
DELIVERIES: 543 | 108 | 20 | 10 | 727
TOTAL PROGRAM: DEV EST (1970) | FY 82 | FY 82-83 | GROWTH | FY 70-83
UNIT COST: 6.98 | 9.26 | -2.4% | +35.8%

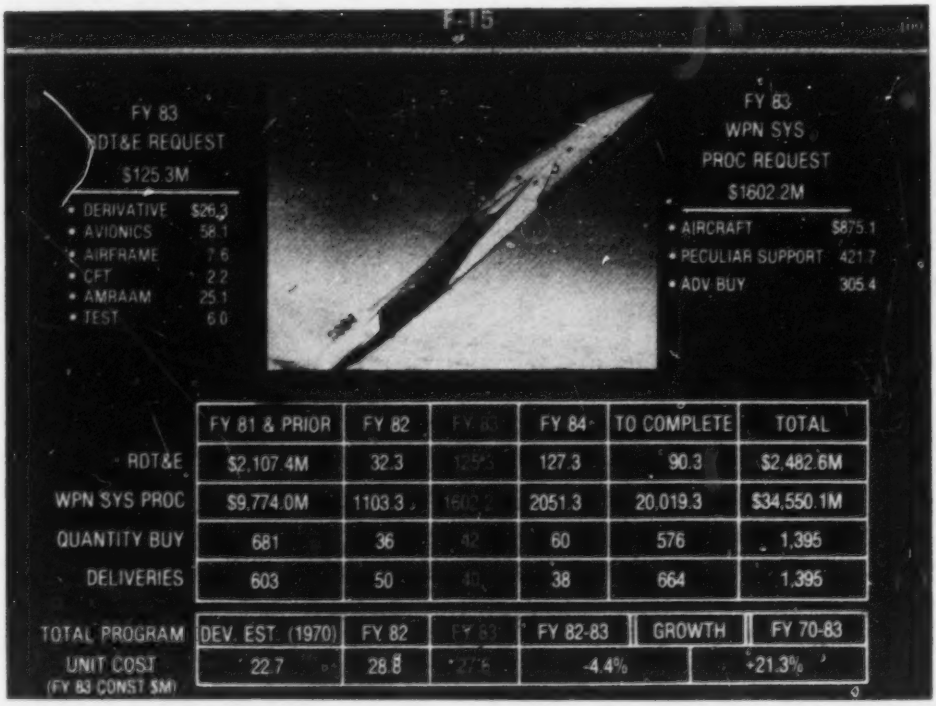
We are requesting $357.3 million to buy those last 20 aircraft in 1983. I am sure you are aware of the unit cost data that has been portrayed on the Army and the Navy slides. It shows that there is a slight increase between 1982 and 1983 in the A-10 force. Some of that has to do with the additional support, and some of that has to do with the two-seater A-10 we are building this year.

F-15

Specialized for air-to-air combat.
Over 630 delivered to Active Forces.
Total buy increased to 1395 aircraft.
First air defense squadron conversion started January 1982.

The F-15, is our premier air-to-air fighter. We have only 630 of them in the Active Forces. We have increased the buy to 1,395. Sometimes people get confused; I have seen things in the paper; and also people have been confused because of the number of airplanes we are going to buy. I tell them it really does not make any difference what that total number is. The point is we are going to have to continue to buy fighter aircraft until we get the new ATF. If you tell me I will have a new TAC fighter in 1995, then I am going to have to buy roughly 280 every year between now and 1995.

So, I don't get too hung up on exactly what that number is, as long as people understand we need 280 a year.

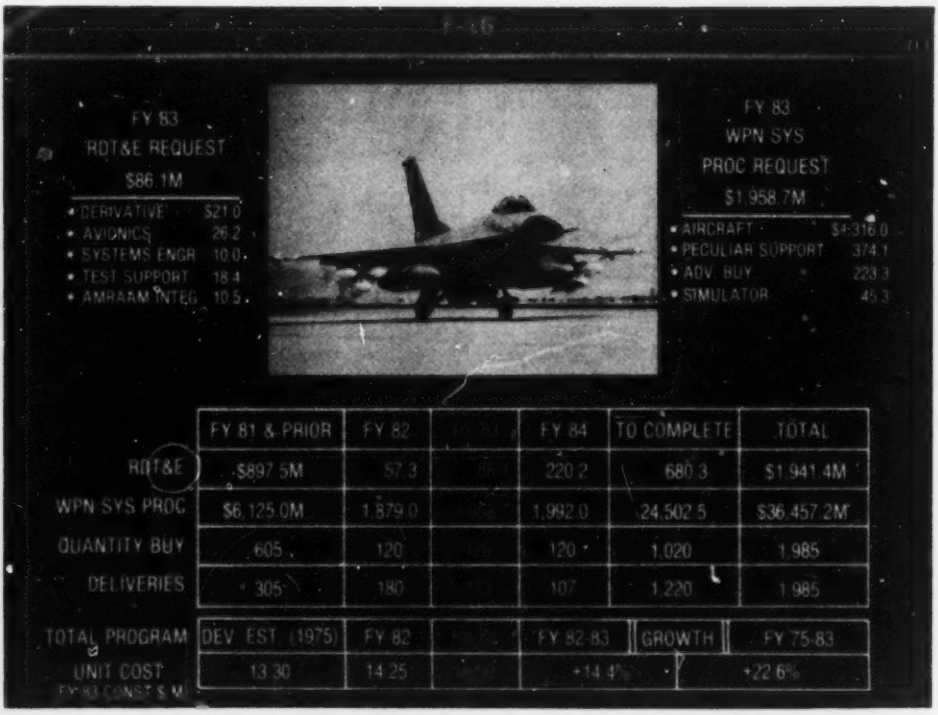

F-15
FY 83
RDT&E REQUEST
$125.3M
• DERIVATIVE $26.3
• AVIONICS 58.1
• AIRFRAME 7.6
• CFT 2.2
• AMRAAM 25.1
• TEST 6.0
FY 83
WPN SYS
PROC REQUEST
$1602.2M
• AIRCRAFT $875.1
• PECULIAR SUPPORT 421.7
• ADV BUY 305.4
FY 81 & PRIOR | FY 82 | FY 84 | TO COMPLETE | TOTAL
RDT&E | $2,107.4M | 32.3 | 127.3 | 90.3 | $2,482.6M
WPN SYS PROC | $9,774.0M | 1103.3 | 2051.3 | 20,019.3 | $34,550.1M
QUANTITY BUY | 681 | 36 | 60 | 576 | 1,395
DELIVERIES | 603 | 50 | 38 | 664 | 1,395
TOTAL PROGRAM | DEV. EST. (1970) | FY 82 | FY 82-83 | GROWTH | FY 70-83
UNIT COST (FY 83 CONST $M) | 22.7 | 28.8 | -4.4% | +21.3%

As I mentioned before, we have converted the First Air Defense Squadron at Langley Air Force Base, Va.; in 1983 we are asking for $1.6 billion to procure 42 airplanes. We are actually going up six airplanes here and the reason that this cost growth actually is a decrease. In other words, the reason we are getting airplanes in 1983 cheaper than we got them in 1982, is partly reflected by the fact that we are buying a few more airplanes.

F-16

Multinational swing fighter.
Over 300 delivered to Active Force.
First F-16's to Reserve Forces in fiscal year 1983.
Total buy increased to 1985 aircraft.
Multiyear procurement initiated in fiscal year 1982.

The F-16 is the swing role fighter or multinational fighter, I should say, that is currently being delivered to the Active Forces. The F-16's will go to the South Carolina Guard in fiscal year 1983. Again, we have increased the total number of aircraft and we have initiated a multiyear procurement. This was done last year. We are procuring 120 a year for 4 years.



We are asking for $1.9 billion in fiscal year 1983 broken down in the procurement budget as seen here—research and development as seen up here. We have some $21 million in this program for the derivative aircraft or the F-16E.

Similarly, we had $26.3 million in the F-15 line for the same purpose.

ADVANCED TACTICAL FIGHTER

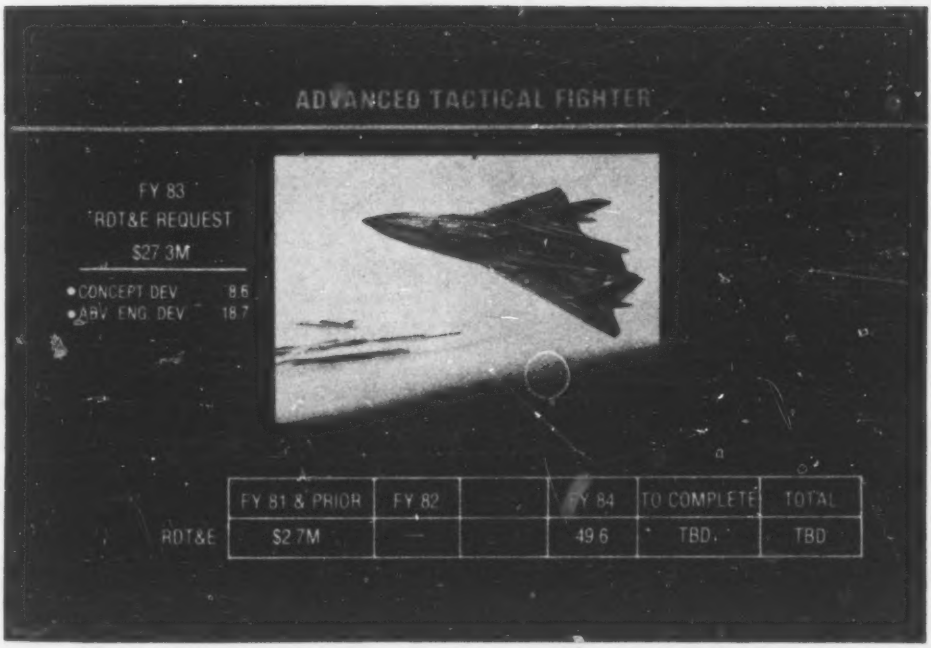
Next generation of fighter aircraft.
Meets the threat and mission needs of 1990's and beyond.
Concepts/critical technology development—fiscal year 1983.
Full scale development decision—fiscal year 1987.

We have just finished talking about the advanced tactical fighter. Let me say a few things:

We want to get started in 1983. That is based on going into full-scale development in 1987 and having a new fighter about in the 1993 timeframe.

Senator GOLDWATER. Is that the Rockwell concept?

General RUSS. There are several concepts. In fact, we have seven different contractors, sir. This one happens to be a Grumman concept. I think this one is a Rockwell. General Dynamics has a concept; McDonnell Douglas has a concept.



What we intend to do is divide this $27.3 million into two categories—$18.7 million to get started on advanced engine development and $8.6 million for aircraft concepts. We would have probably the seven contractors come in and start doing some more design work so that we can select down to one contractor by 1987.

FIGHTER ENGINES

Component improvement program (CIP): Solves service revealed deficiencies of inventory engines and reduces cost of ownership.

Engine model derivative program (EMDP): Derivatives of existing engines to meet changing requirements.

Alternate fighter engine (AFE): Full scale development of alternate competitive engines.

Now, to keep those fighters in the air we have to have engines and sometimes the engine programs, because of the way they are divided, are difficult to understand. Let me see if I can't go through this in a systematic way and show you what we have in the engine line for our F-100 and our F-101 engines. We really have three areas. One is what we call component improvement program, one called engine model derivative, and one called alternate fighter engine.

The real difference between these is that in this first line what you do is try to improve the engine up to the specs that are already laid down. In other words, you don't try to add thrust to it; you don't try to boost it up above what it was initially designed to do. If you want to improve it from what it was initially designed to do, then you do the second line. Then if you decide you want to put that in the airplane, you move it to the third line and you go ahead and run it through the full development.

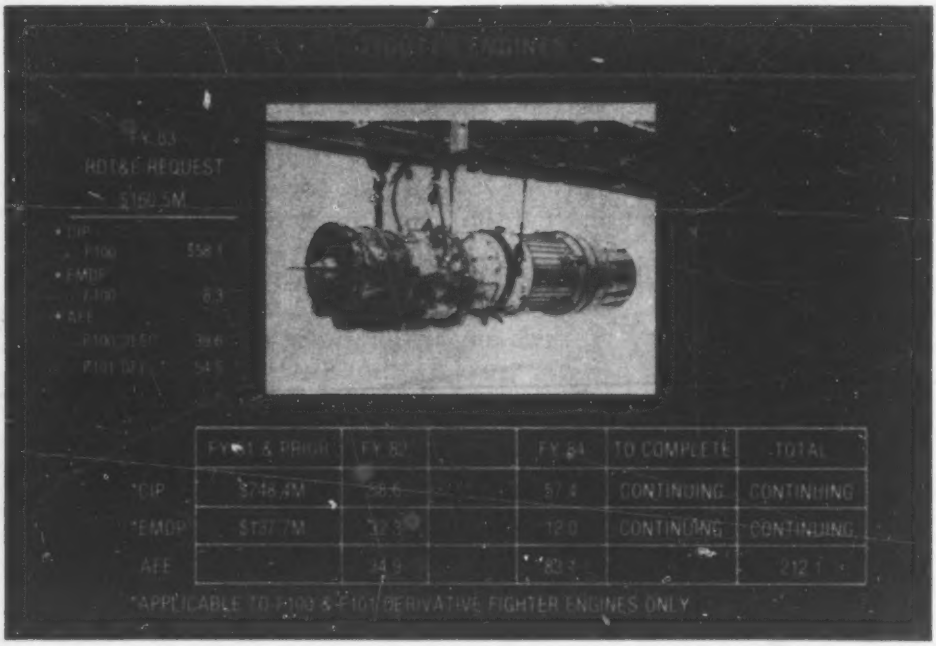
Senator GOLDWATER. What thrust are you talking about in your next-buy engine?

General RUSS. For our advanced TAC fighter, sir?

Senator GOLDWATER. Yes.

General RUSS. We are looking to 30,000 to 40,000 pound thrust for a single engine and for twin engine it would be something less than that. It depends on what concept we go with on this advanced TAC fighter.

The way we are looking at it now, it would be about the size of an F-15, so it would have similar characteristics. One of the things we think has a very high payoff is supersonic cruise. We have developed with NASA some techniques that will allow us to better mold the wings and fuselage and allow us to cruise, we believe, supersonic, without using an afterburner; therefore, we get to the target and back a lot faster.



The engines are divided: Here is how the moneys are broken down: In the alternate fighter engine we would be doing fullscale development on the F-101 and F-100 engines.

FIGHTER/ATTACK FORCE—CONGRESSIONAL GUIDANCE

F100/F101 DERIVATIVE ENGINES

"Congressional intent that there be full and fair competing engine designs for any follow on engines."—Senate Armed Services Committee.

"$8.3 million is provided to support a flight test evaluation of the F-16E using competitive derivative engines."—Authorization Conference.

Although the Air Force is on record as having no present requirement for higher thrust engines, the conferees are concerned that such a requirement may emerge in the future. The conferees agree to add $17,500,000 above the budget for development

work on increasing the thrust of existing F100 engines."—Appropriations Conference.

Let us show you what Congress told us to do last year. Last year we were told that whatever we do, we ought to have a fair and full competition between engines if we are going to buy any more follow-on engines. We were also told that we could conduct a flight test of F-16E with derivative engines. That we are doing.

The first F-16E will be out in July; it will have an F-100 engine in it. Another one will be out in August or September and it will have an F-101 engine in it. Those two airplanes will be flying with the different engines.

In addition to that, the appropriations conference added $17.5 million in development to increase the thrust of the F-100 engine, should the Air Force need that in the future. We have not indicated a requirement for it, but it was their judgment that a requirement may emerge in the future.

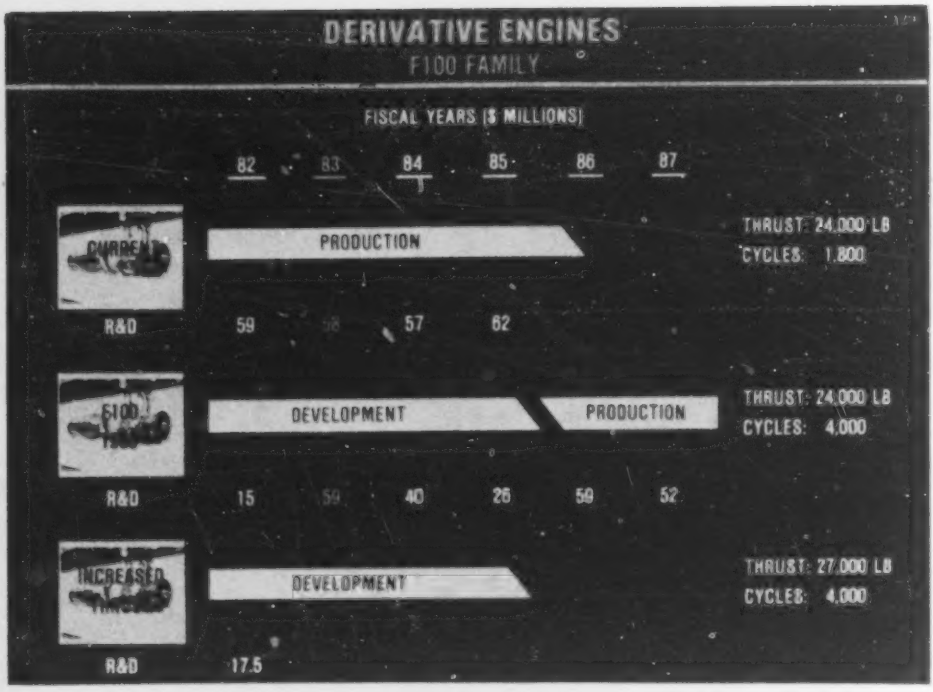
Senator GOLDWATER. Let me ask you a question: This summer, in July, General Dynamics will fly the first F-16E. It is my understanding both the 100 and the 101 engines will be evaluated in the F-16E?

General RUSS. They will be flown in both those airplanes.

Senator GOLDWATER. If the 101 has a thrust advantage over the 100, how will you insure that that advantage is not prejudiced in competition?

General RUSS. I will show you that in the next chart, sir, if I may.

Senator GOLDWATER. I have one other question that you might touch on: Should the Air Force select the 101 to power the F-16E, is the Air Force considering redesigning the intake to take advantage of the additional thrust available?



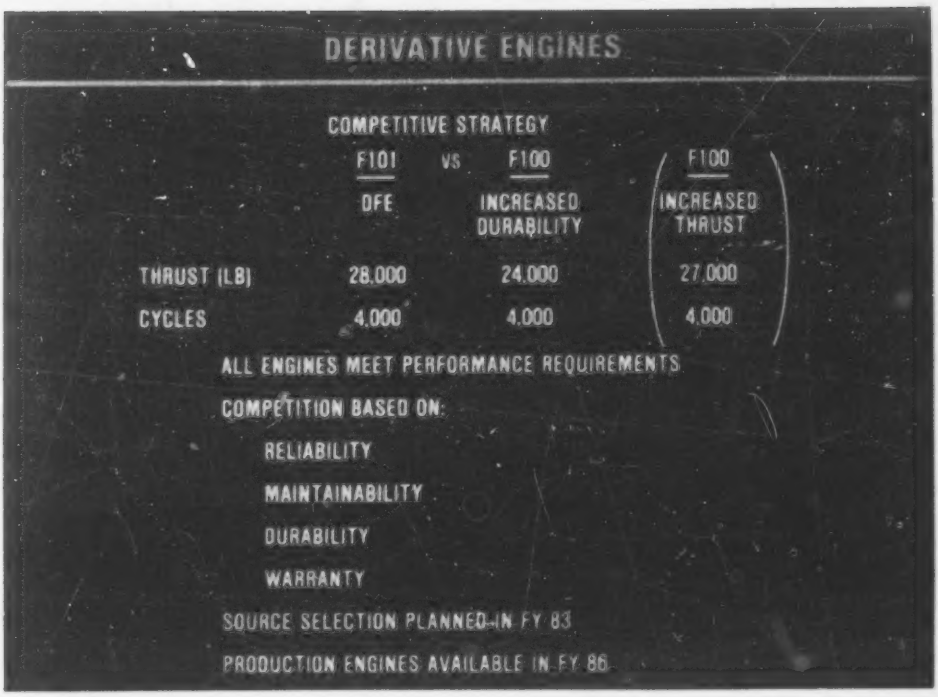
General Russ. The answer to that is no, we are not.

Let me take you through this, if I may, because it is important to note where the thrust equation comes into this sort of thing.

This is the current airplane we have. This is the engine we have in the F-15. These are the moneys that we are using to keep it up to snuff and up to the performance we would like to have. That engine puts out approximately 24,000 pounds of thrust and has about 1,800 cycles before we have to overhaul. Now, this engine we have under development, is an F-100 with improvements to give it a 4,000-cycle life; in other words, we only have to send it back every 7½ years to get it broken down. Again, that has 24,000 pounds of thrust.

Now, this third engine down here is the one that Congress last year added $17.5 million for and said if you do need more thrust, maybe we ought to put some money in the program to do that. I draw your attention to the fact that we do not have any money in 1983, 1984, 1985 to continue that program because the Air Force's position is that we do not need the extra thrust.

Anyway, that is 27,000 pounds.



When Congress told us to do competition and to make sure we have fair competition, we said what are we going to compete on? This is the 101 engine that has the 28,000 pounds of thrust and 4,000 cycles and this is the F-100 which has the increased durability, only 24,000 pounds of thrust and 4,000 cycles.

The Air Force decided that either one of those engines would meet the performance requirement that is needed; so, studies and analyses did a study; General Dynamics did a study, and both came up with the same conclusion, that either one of those engines in the F-16 will give the needed capability. Sometimes that is hard to believe because one has 4,000 pounds more thrust than the other.

We must understand that the F-16 was designed to fly with the F-100 engine. While the F-101 has 4,000 pounds more thrust, it has 800 pounds more weight, so it is heavier and the aircraft was not designed to take that engine specifically.

This 101 engine takes about 270 lbs./sec. of air in the front end of it, if you have a scoop big enough to do that. The F-16 scoop is not big enough to do that. If you put the 101 engine on the F-16 you can't get the total thrust of that engine. That is why the Air Force says that both of these engines are comparable and both of them are competitive, and we would like to compete the two of them for our future buy.

We are really interested in these sorts of things. You know the problem we have had with the F-100 as well as I do, but the reliability, maintainability, durability—those are problems we have had with our engine. We want to compete General Electric and Pratt & Whitney on those sorts of things and make them sign up to the warranty.

Then we would go for source selection in 1983 and have production engines in 1986.

TACTICAL AIR FORCES

R.D.T. & E. AND PROCUREMENT PROGRAMS

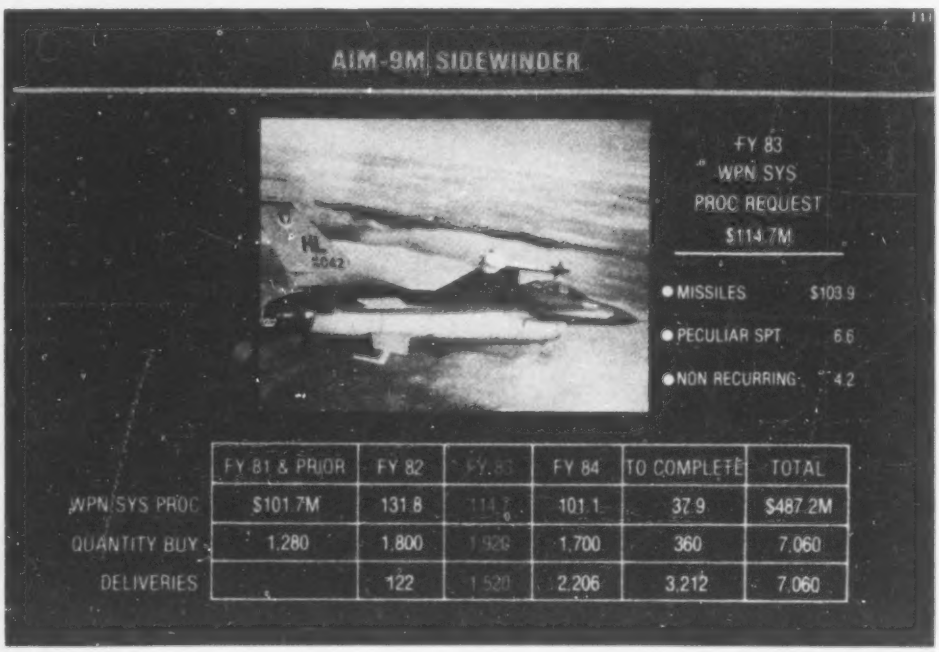
Fighter attack aircraft.
Antiaircraft missiles.
Air-to-Surface weapons.
Defense suppression/electronic warfare.
Other tactical forces.

Sir, I would like to move now to antiaircraft missiles.

AIM-9

I will start with the AIM-9 Sidewinder—our short-range infrared missile. As you know, we can shoot it [deleted]. This is an AIM-9 front quarter shot. It is hard to see. It is a very capable missile and is a joint Air Force-Navy program. We will get the last AIM-9L guidance and control units in July and the first AIM-9M's in September of this year. The AIM-9M has an improved capability against flares and also it has a low-smoke motor so you can't see it coming at you.

This is our track record on missiles. The top line indicates funding versus the requirements. The bottom dashed line indicates what is in the inventory, and naturally it lags a year and a half or so behind the funding. What this says is back in 1980 we had [deleted] percent of our requirement funded. By 1984 we have [deleted] of our requirement funded and they should be [deleted] so we are set upon a program that will get us well in AIM-9M's.



	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
WPN SYS PROC	$101.7M	131.8	114.7	101.1	37.9	$487.2M
QUANTITY BUY	1,280	1,800	1,920	1,700	360	7,060
DELIVERIES		122	1,520	2,206	3,212	7,060

It depends upon the money, about $114 million to 1,920 missiles.

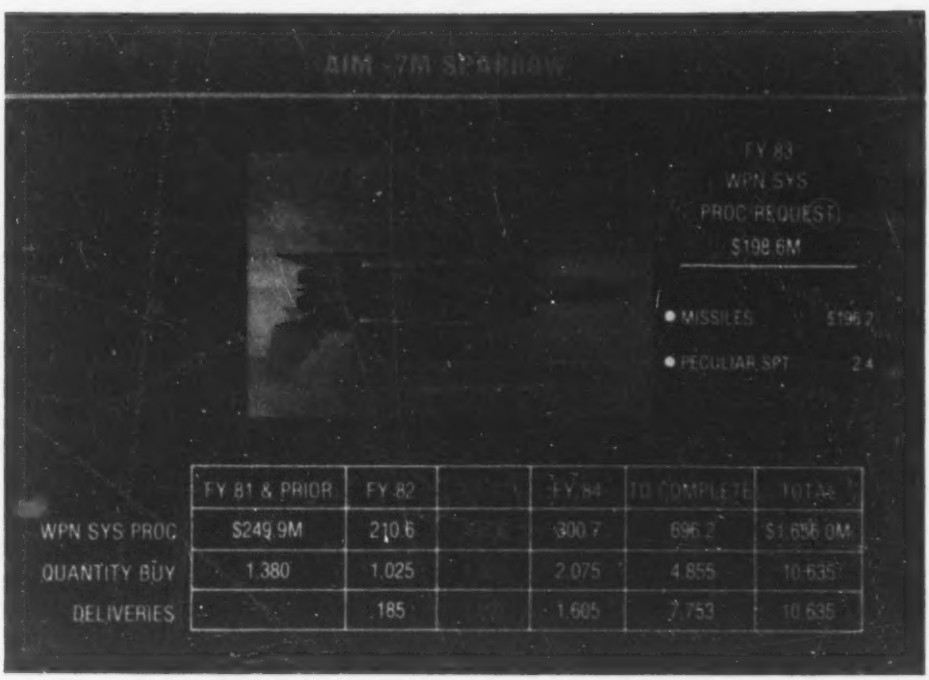
AIM-7 SPARROW

Medium-range radar missile.
Primary air-to-air missile for F-15.
AIM-7F last delivery June 1982.
AIM-7M first delivery March 1982.

The AIM-7 is, of course, our medium-range radar missile and the primary ordnance for the F-15. We also fire a previous version of it on our F-4's. We will get the last AIM-7F's in June. We start getting the AIM-7M's in March 1982.

This is where we have been. Again, about [deleted] percent funded.

Like General Smith said, of the problem over in Europe, we just hadn't put the money for it. We have now set out on this program. We will reach about [deleted] percent in 1986. The reason it does not go any higher than that is because the AMRAAM, which I will show you in a minute, picks up from there and continues on to fully flesh out the inventory. To do that, we are asking for $198.6 million for 1,300 AIM-7 missiles.



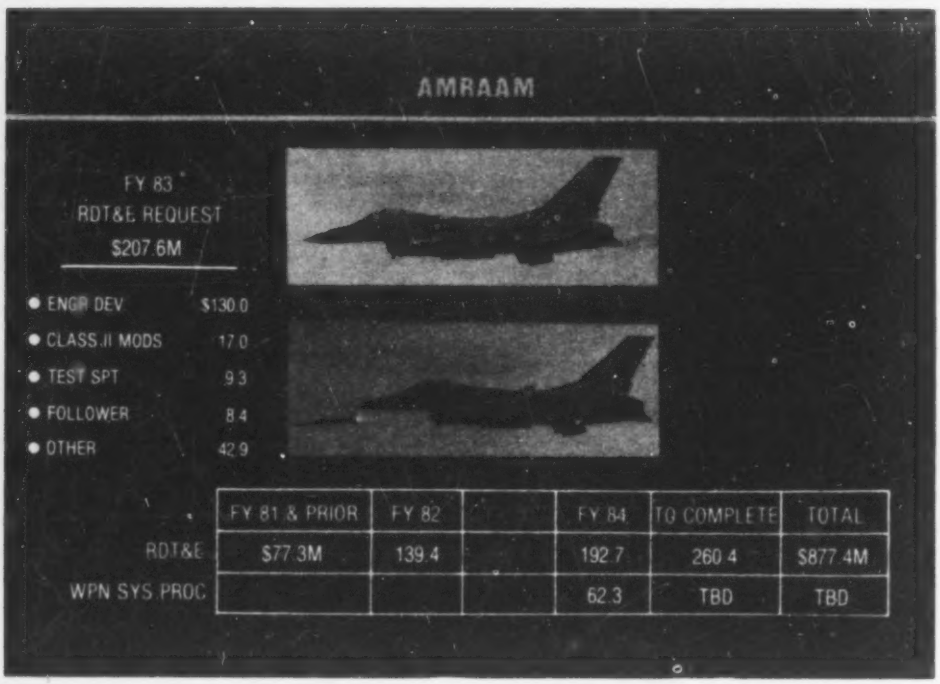
Now, we have some problems with the AIM-7 missiles in our testing. We [deleted] of them and only [deleted] of them functioned properly. We found we had some firmware problems and quality control problems. We have since gone back and fixed the firmware problems and hopefully the quality control problems. They will start testing again next month.

The Navy manages this program for us and has done an excellent job.

AMRAAM

All environment, all aspect radar missile.
Required to meet numerically superior threat.
Will be primary ordnance for F-15 and F-16.
Competitive validation complete.
First production delivery, late 1985.

The third missile is our AMRAAM or our next generation all aspect radar missile. It will be the primary ordnance on the F-15 and the F-16. As you know, the F-16 [deleted] and therefore it is important that we get the AMRAAM into the fleet.



We are looking for first production around 1985, coming into the fleet in [deleted] as indicated here. Funding starts for procurement in 1984 and gradually builds.

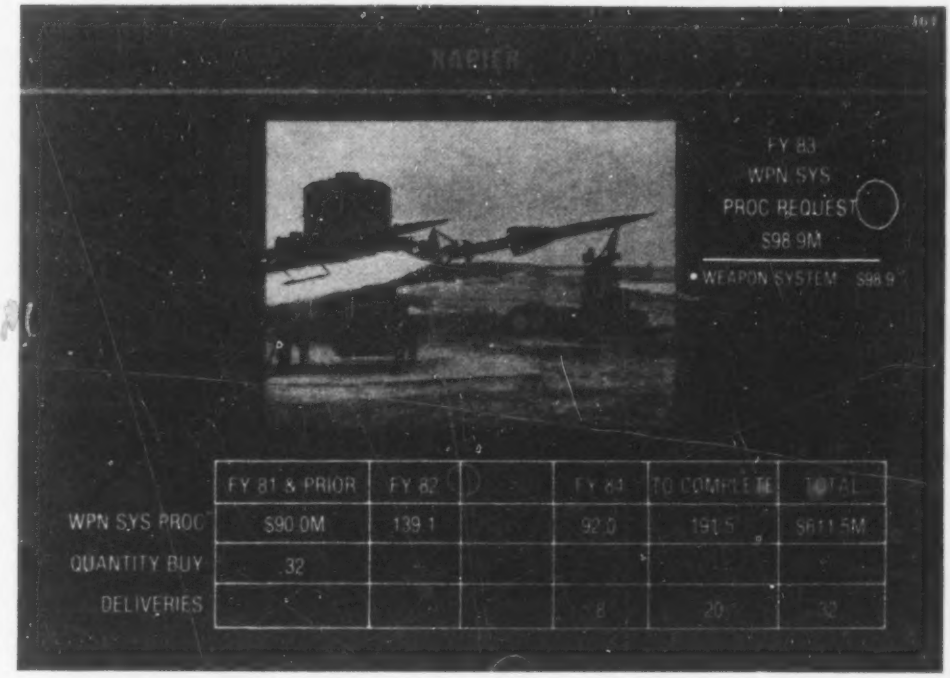
Senator GOLDWATER. What is your projected unit cost on that?

General RUSS. Projected unit cost on the AMRAAM in 1978 dollars, which is the Government estimate, is $113,000. In 1982 dollars it is $158,000. If you use by comparison a then-year dollar for an AIM-7, it is $149,000.

RAPIER

Short range surface-to-air missile.
Point defense of U.S. air bases in United Kingdom.
Procure 28 operational and 4 training units.
First delivery May 1983.

The Rapier is a short-range surface-to-air missile we are procuring to defend our bases in the United Kingdom. Our plan is to procure 32 units, four training and 28 operational units.



Our first unit we expect to get a year from now. We are asking in 1983 for 98.2 million. The quantity of 32 was approved as a lump by Congress last year. It is a way of incrementally funding this program.

Senator GOLDWATER. Gentleman, I hate to interrupt, but I am not feeling too well. We have another session tomorrow. You have done pretty well this morning. I think we will knock it off. We can take it up tomorrow morning.

Senator THURMOND. Dr. Keel, I would like to welcome you to this hearing and commend you for the fine job you and your personnel have done.

I fully support the President's program to strengthen our defenses. The Soviet military buildup has been massive and continuous in all areas. Soviet fighter aircraft production exceeds 1,300 aircraft per year and according to this year's budget request the United States will procure less than 200 fighter aircraft.

I have some questions which I will submit for the hearing record.

[Questions with answers supplied follow:]

QUESTIONS SUBMITED BY SENATOR STROM THURMOND

SUFFICIENT FIGHTER AIRCRAFT PROCUREMENT

Senator THURMOND. Dr. Keel, in light of the fact that our fighters average twice the age of Soviet fighters, do you feel that our fighters aircraft procurement is sufficient to meet the challenges that lie ahead?

Dr. KEEL. Current fighter procurement will allow us to build to 44 tactical fighter wings by fiscal year 1990. This will greatly increase our current capabilities and provide a basis for countering the increasing Soviet threat.

FOURTH GENERATION OF SOVIET FIGHTERS

Senator THURMOND. Dr. Keel, in your statement you refer to the fourth generation of Soviet fighters. I understand that they will be very similar to our F-15 and F-16. As our qualitative edge diminishes do you see a point in the future when the comparision between United States and Soviet fighters will be strictly numerical?

Dr. KEEL. No, we believe we can maintain the qualitative edge through such programs as the derivative fighter and the advanced tactical fighter.

SOVIET FIGHTERS THIRD-GENERATION AIRCRAFT

Senator THURMOND. Dr. Keel, you have stated for the record that about [deleted] are the current third-generation aircraft. What proportion of our fighter forces belongs in this category?

Dr. KEEL. By the end of fiscal year 1982 we will have [deleted] fighters in our tactical air forces. [Deleted] of these fighter will be third-generation F-15 or F-16 aircraft.

HARDENED AND SURVIVABLE C^3 CAPABILITY

Senator THURMOND. Dr. Keel, a hardened and survivable C^3 capability is imperative in order to have a credible second-strike capability. Are there any current developments in C^3 research that would make one form of MX basing more desirable?

Dr. KEEL. Although the MX C^3 capability is considered an integral part of the weapon system, C^3 is being evaluated as one element of the total MX weapon system. Specifically, none of the current or planned C^3 systems drive one form of a MX basing mode. Most important, the eventual MX C^3 system will be designed to fully support the overall MX basing decision rather than being the primary factor used to determine the actual basing mode.

Senator GOLDWATER. Thank you. I apologize. I will see you tomorrow morning.

General SMITH. Thank you.

[Whereupon, at 10:50 a.m., the subcommittee was adjourned, to reconvene at 9 a.m. on Wednesday, March 17, 1982.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

WEDNESDAY, MARCH 17, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

AIR FORCE TACTICAL PROGRAMS

The subcommittee met in executive session, pursuant to notice at 9:02 a.m., in room S-407, the Capitol, Senator Barry Goldwater (chairman) presiding.

Present: Senator Goldwater.

Staff present: Robert S. Dotson, José E. Martinez and Carl M. Smith, professional staff members; and Tamara L. Jones, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Buzz Hefti, assistant to Senator Warner; Jon Etherton, assistant to Senator Jepsen; and Frank Krebs, assistant to Senator Cannon.

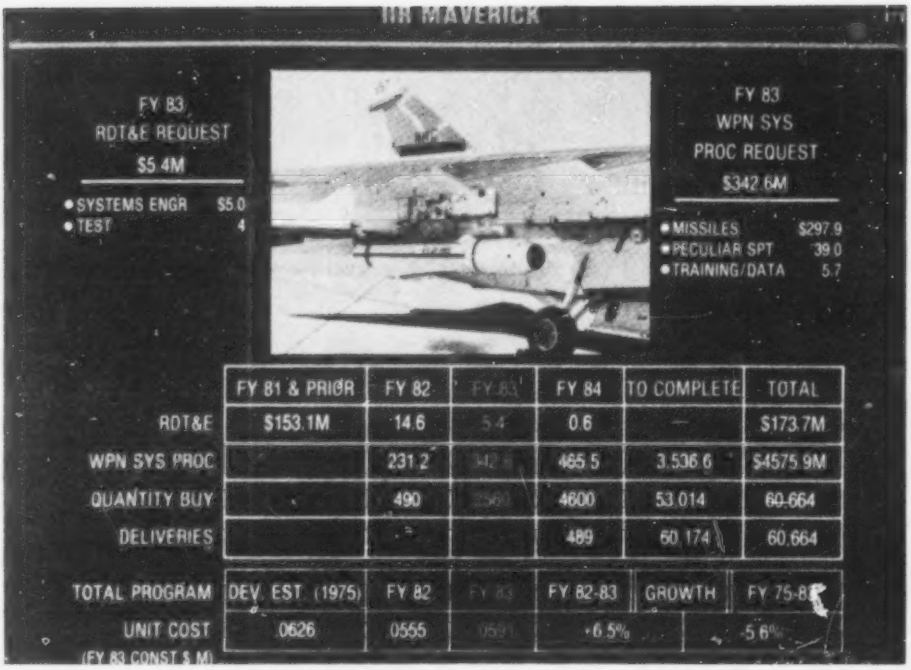
Senator GOLDWATER. The meeting will come to order. You may proceed as you wish, General Russ.

STATEMENT OF MAJ. GEN. ROBERT D. RUSS, USAF, DIRECTOR OF OPERATIONAL REQUIREMENTS, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR R.D. & A., DEPARTMENT OF THE AIR FORCE—Continuing

General RUSS. As you will recall, yesterday we had gone through the antiaircraft missiles. I would like to pick up today starting with air-to-surface weapons.

The first weapon I will discuss is the Maverick, a standoff air-to-surface missile. It comes in three different types—the TV version, of which the Air Force has approximately 19,000; the infrared version, which we are currently developing; and the laser Maverick, which is being developed by the Air Force for the Marine Corps.

They are compatible with a variety of aircraft. Initial production with the IZR version is supposed to start in 1982. We have had problems with the Maverick. While we were initially supposed to procure 490 of those in 1982, it looks like now we will probably procure approximately 200.



We have had reliability and maintainability problems. We have had our operational tests. We have had 15 launches; 11 of the launches were successful, but 4 of the launches failed. Two of them were primarily a problem with the solder joint in the back end. One of them was a software problem and one was a G bias problem; however, our biggest problem is the mean time between failures and the reliability rate, therefore, we are slowing down our initial procurement and are going to do some more tests so that we can increase the reliability and hopefully we will be able to ramp up to our full production schedule in 1983 and 1984.

What that means, Mr. Chairman, is that in all probability the amounts of money that we have in 1983 will be less than what we have in our current budget. We will have to get back to you and show you what that will be. I don't know what that is right now.

Hughes Aircraft and Systems Command are negotiating contracts now on 1982. When that occurs, then the amount of weapons we buy in 1983 will probably change.

Senator GOLDWATER. When did you start making those missiles?

General RUSS. We are supposed to start making them this year.

Senator GOLDWATER. Just this year?

General RUSS. Yes, sir, we have had the previous versions for quite some time. This version changes the front end and puts an infrared seeker in the front end of it.

Senator GOLDWATER. We have been told one of the problems with this Maverick has been malfunctioning actuators. Are these the same actuators that were on the old TV Maverick?

General RUSS. Yes, sir. I think the actuators are the same, to the best of my knowledge.

The problems we have had with the missile itself revolve around the fact that you can fire this missile a lot farther than you can

fire the other missile, the TV version, because you can pick up a target a lot farther out. What has happened, therefore, is that this stays in flight longer and it gets hotter than the other missile did, so that some of the soldered joints and some of the problems that we didn't have in the previous missile we have found occur in this missile.

Another thing is that we have had some actuator problems on the training version which we will be carrying all the time because you don't fire it; therefore, we are making a lot of improvements on the missile and nose sections. We have had problems with the training version of it.

Senator GOLDWATER. At what speed does this missile fly?

General RUSS. It is supersonic.

Senator GOLDWATER. How much supersonic?

General RUSS. I really don't know, sir.

Senator GOLDWATER. It must be close to 1.5 to get that kind of heat, isn't that true?

General RUSS. Yes. It gets skin heat but that's considered negligible. The real heat is the amount of heat that is generated from the rocket motor.

Senator GOLDWATER. Isn't the problem the result of inadequate control of this feature? Does this mean that many of our inventory missiles may also have faulty actuators?

General RUSS. We don't think so, sir. We have not had the same problems with the current inventory weapons which are TV guided. The only type we have had problems with is this version here.

Senator GOLDWATER. Do you think you have given the inventory an adequate check?

General RUSS. I have been told, sir, that the inventory that we currently have is all right. The problems that we have are involved in this missile, so I don't believe that is going to give us a problem.

Senator GOLDWATER. Please proceed.

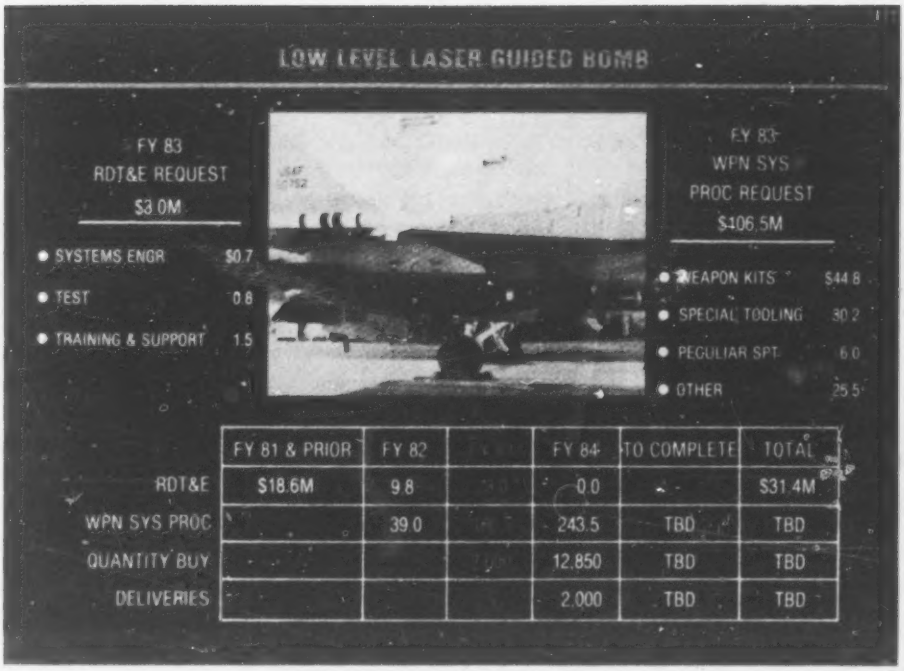
General RUSS. The next one I would like to cover is our low-level laser-guided bomb.

As you know, we take a regular 500 pound bomb, or 2,000 pound bomb, and put wings on the front end and wings on the back of it. It gives us a standoff capability. Our current laser-guided bomb inventory has to be dropped at a higher altitude to be really effective. With this bomb we can drop at low altitude, [deleted] some [deleted] back of the target.

It is in full-scale development. We have been testing. This is a shot against a built-up target. Our average CEP has been a little under [deleted] foot miss. We are very much satisfied with the weapon.

Senator GOLDWATER. What is your maximum range with this?

General RUSS. [Deleted] at low altitude, sir. That is at a normal penetration speed of about [deleted].

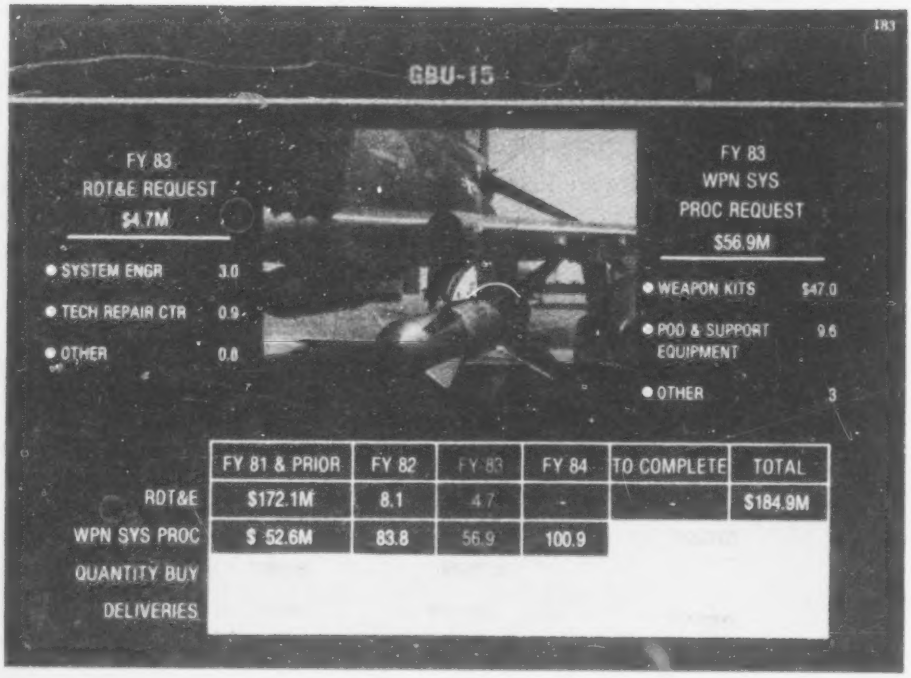

LOW LEVEL LASER GUIDED BOMB
FY 83
RDT&E REQUEST
$3.0M
• SYSTEMS ENGR $0.7
• TEST 0.8
• TRAINING & SUPPORT 1.5
FY 83
WPN SYS
PROC REQUEST
$106.5M
• WEAPON KITS $44.8
• SPECIAL TOOLING 30.2
• PEGULIAR SPT 6.0
• OTHER 25.5
FY 81 & PRIOR | FY 82 | | FY 84 | TO COMPLETE | TOTAL
RDT&E | $18.6M | 9.8 | | 0.0 | | $31.4M
WPN SYS PROC | | 39.0 | | 243.5 | TBD | TBD
QUANTITY BUY | | | | 12,850 | TBD | TBD
DELIVERIES | | | | 2,000 | TBD | TBD

In 1983 we have some small moneys going into the research and development to finish it off, and we are starting to buy our kits, particular support equipment and some of the tooling.

Our ultimate objective has not been fully determined yet, but we estimate we will probably want about [deleted]. We already have [deleted] of the other types of laser-guided bombs, so we will need about [deleted] of these.

The GBU-15 bomb is in production; it is a 2,000-pound bomb, has a TV sensor in the front and is controlled by data link. The picture on the left [picture deleted] shows how it is employed, launched [deleted] from the target, the target being a high value target such as a bridge. The fighter moves in at about [deleted] releases it at [deleted]. The bomb climbs, heads for the target; it has a data link in it and sends the picture back to the airplane. The backseater looks at it on his scope, controls the cross-hairs, locks it onto the target and the airplane can evade and stay at low altitude.

The TV version is in production. Naturally, being TV, it is a day-only system. We have in development an infrared nose to go onto it so that we can use it at night. The infrared nose is very similar to the one that is on the Maverick.

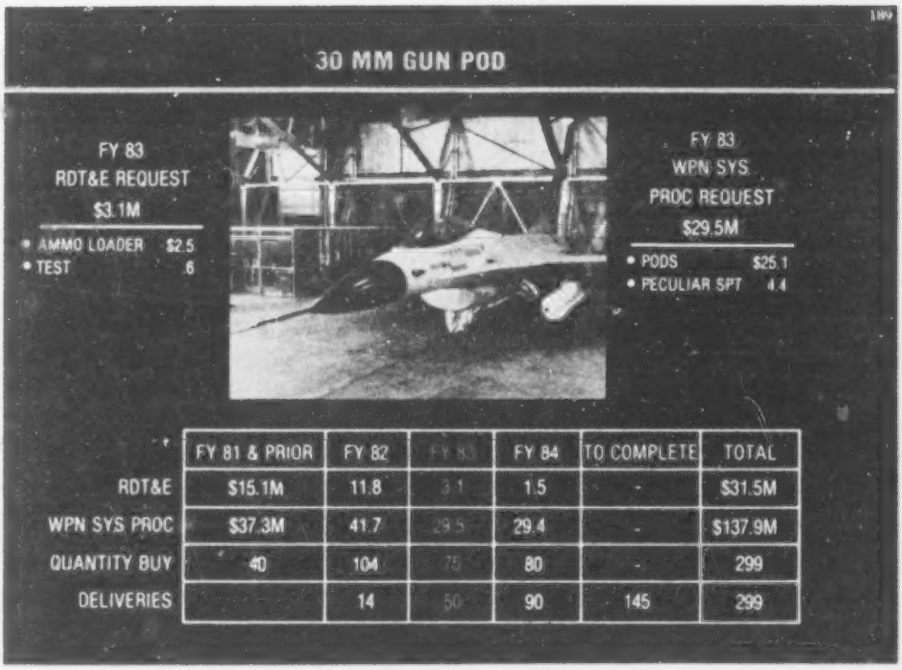


In 1983, we are asking for about $4.7 million. It is broken down on the left side of the slide—research and development for infrared, that should be completed in 1983.

We are buying some 250 kits and some pod and support equipment and some other data.

Our 30-millimeter gun pod is a very simple antiarmor capability that will be able to be used on the F–4, the A–7, and the F–16. It has a four-barrel Gatling gun compared to the seven-barrel Gatling that we currently have in the A–10. It fires the same ammunition as the A–10.

We awarded a contract in July 1980. We expect initial operational capability this year. The first pods will go to the RDF units and Moody Air Force Base in Georgia will get the first pod.



We have tested the pod on the F-4 and the A-7. We are having some problems on the F-16; it is a vibration problem.

Senator GOLDWATER. What is the weight of that pod?

General RUSS. It is about 2,000 pounds with ammunition, sir.

Senator GOLDWATER. How does that affect the flying characteristics of the airplane?

General RUSS. It is just like carrying a 2,000-pound bomb, sir.

Senator GOLDWATER. Do you normally balance those bombs?

General RUSS. Yes, sir. As an example, when you put it out on a store station like this, you can imagine when you fire it, you get some movement. On the F-16, we want to carry it on the centerline station so that you do away with that yaw motion that you will get. The pilot can damp out that yaw motion but we have a fix to put in the A-7 aircraft, as an example, that gives it a little rudder through the normal control system when you pull the trigger.

The problem we are having with the F-16 is vibration; because of the vibration on the centerline it is giving us a little bit of a problem. We are not sure how to solve that yet, but we are working on it. We do not anticipate any problem on the F-4 or the A-7. Our total buy of 299 here is based on the F-4 and the A-7.

As soon as we get the problem sorted out on the F-16, we probably will buy some more for the F-16.

Senator GOLDWATER. How many rounds will that carry?

General RUSS. 353 rounds.

Senator GOLDWATER. How much weight is that?

General RUSS. That is all totaled in the 2,000 pounds.

Senator GOLDWATER. How much of a job is it to reload?

General RUSS. Right now we are using the A-10 ammo loader. You can load it in probably 10 to 15 minutes; however, we are developing a low-cost loader that we can move around the aircraft more easily; it will be much easier to handle in the field. Since the A-10 has about 1,300 rounds in it, it is much more complex than

just loading 353 rounds in this, so we are going to have a simplified loader of the old type that can be operated manually if necessary. It will be easily portable and we can take it out in the field with us.

Senator GOLDWATER. What does that 30 millimeter weigh now?

General RUSS. I think it is 1.5 pounds, sir, if I recall correctly.

Senator GOLDWATER. Do you know the current price we are paying for that shell? Is it $250?

General RUSS. I don't know, sir, what we are paying for it.

Senator GOLDWATER. Will you supply that for the record?

General RUSS. Yes, sir, I will.

As you know, we have gone on multiyear contract for 30-millimeter ammo. We have really brought the price down. That is one of the good examples of multiyear procurement.

Senator GOLDWATER. Do you know who is making that?

General RUSS. No, I don't.

Senator GOLDWATER. I wish you would find that out, too.

General RUSS. All right, sir.

[The information follows:]

WEIGHT OF 30MM SHELL

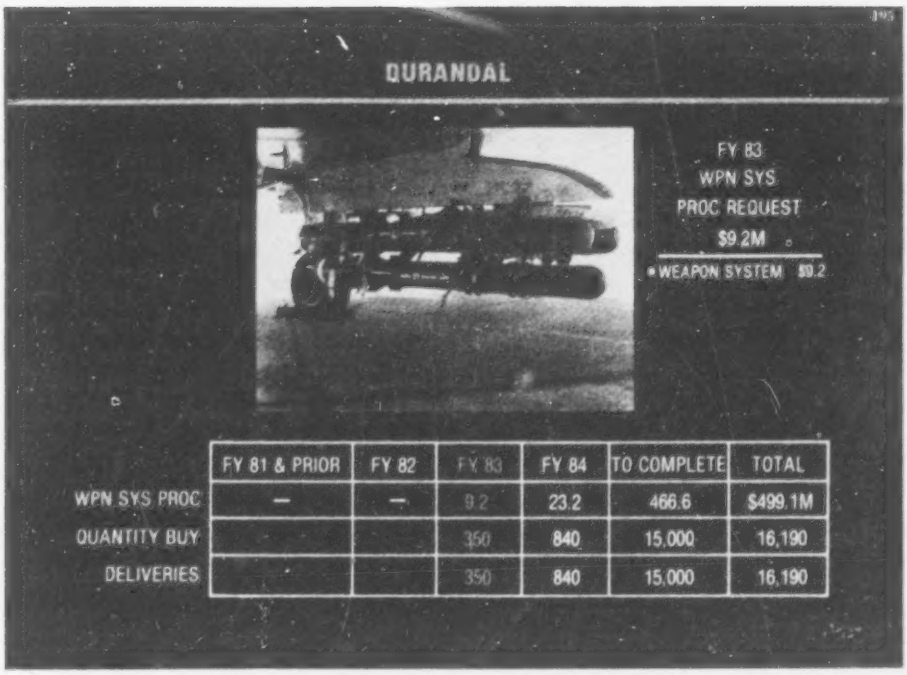
The GAU-8/A ammunition weight is 1.53 pounds for 30mm Training and High Explosive Incendiary (HEI) and 1.65 pounds for 30mm Armor Piercing Incendiary (API). The cost of GAU-8/A upround unit in fiscal year 1982 is $11.08 per round of 30mm Training, $16.77 per round of 30mm HEI and $21.73 per round of 30mm API.

CONTRACTOR FOR 30MM SHELL

The 30mm ammunition is produced by Aerojet Ordnance Co., Downey, CA and Honeywell, Incorporated, Minneapolis. MN, through competitive multi-year contract.

General RUSS. The next weapon is Durandal, which is an airfield attack weapon. Let me walk you through the sequence of how it is delivered. The aircraft comes in about [deleted] over the runway at [deleted] the weapon comes off; a small dragchute comes out, pulls out a large chute; it points the nose of the bomb down. Once the nose of the bomb gets pointed down, a rocket fires and releases the chute; the weapon goes through the runway and then explodes. It blows a hole about 15 feet across; with the heave on the outside of that, it is probably about 20 feet. It is 3 to 4 feet deep.

This is a weapon that is produced in France. We have done testing on the weapon at Eglin and we have qualified it on the F-4 and the F-111 and we have completed form and fit checks on the F-16. We will make a production decision this year. As you can see, there are no research and development funds involved, buying it from the French.



	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
WPN SYS PROC	—	—	9.2	23.2	466.6	$499.1M
QUANTITY BUY			350	840	15,000	16,190
DELIVERIES			350	840	15,000	16,190

We need a near-term weapon. As you know, right now the only weapons we use for airfield attack are old Mark 82 bombs that we had in World War II. The exposure time is significant for our current frontline forces going against airfields. They are exposed at least 30 seconds by the time they pop up and have to roll in and drop.

While you have to fly over the runway with this weapon, your exposure time at [deleted] should be around [deleted] seconds.

Senator GOLDWATER. Are they testing this at Eglin?

General RUSS. Yes, sir; we have tested it at Eglin for the last year.

Senator GOLDWATER. I would like to go down to Eglin to look at some other weapon systems. I would like to do it at a time when they might be testing this.

General RUSS. I am not sure how many more drops they are going to make, but we will certainly set that up, sir, and let you see it.

I have a small filmclip on this weapon that I will send over. It is in a small suitcase. You can pop it open and look at it. It is about 5 minutes. It shows the sequence; it shows the destruction of the bomb; it shows how the testing has gone. I think it would be useful to see. I am sure you would be interested in it.

Senator GOLDWATER. Is this released by the pilot with a conventional sight or is is it a computerized sight?

General RUSS. When he comes across the runway he sets his intervalometer to kick them off at so many milliseconds. As you can see, he carries six on one side of the airplane, six on the other side of the airplane. It is like a 500-pound bomb; it matches exactly to the current racks so there is no change in the airframe. It is the same circuitry in the airplane.

Senator GOLDWATER. At what altitude is it released?

General RUSS. [Deleted] and tested up to [deleted] air speed.

In our initial testing we found that the parachute was not quite big enough and they made a modification to the parachute.

As you know, the fighter pilot wants to go as fast as he can down there and if the airplane can go [deleted] he wants to do that, so we want to make sure we could drop it at that speed.

The next weapon is the wide-area antiarmor munition.

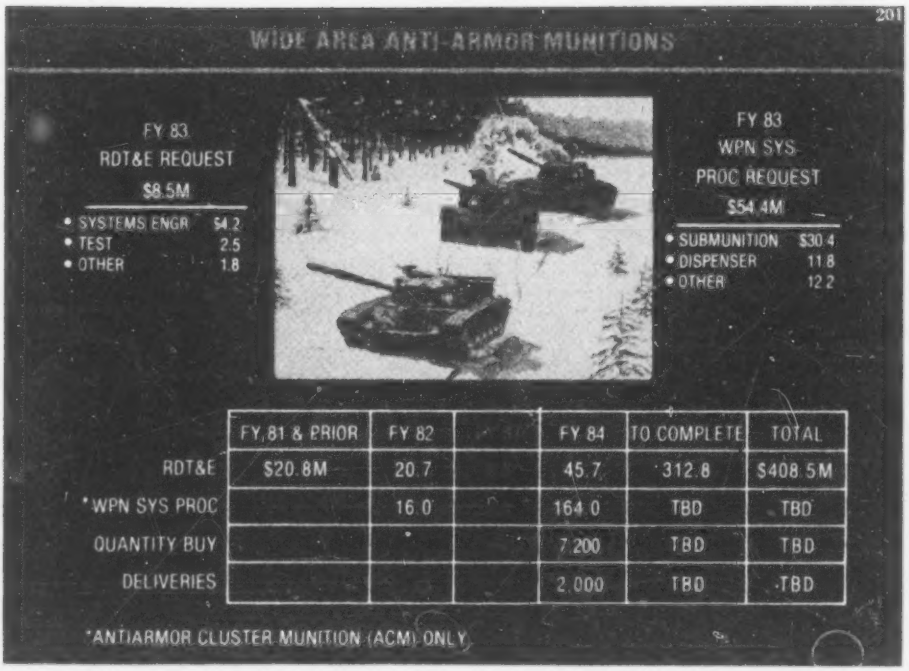
In this family currently we have two different types of weapons. One is the cluster munition and the other is the Wasp. The cluster munition is dropped from the munitions pod here, which we call the TMD, tactical munitions dispenser. As the submunitions come out they float on little parachutes. At the bottom they have this long rod. When that rod touches the ground it detonates the warhead sending fragments in three different directions and one fragment down. They go at very high velocity and it goes through the side of any tank in the area, or if it should happen to hit the tank on the top it goes through the top. We expect to complete the development of the ACM in 1983.

We have had some problems with the ACM at our recent testing at Eglin. I am sure they can discuss this with you, too, when you get down to Eglin, sir.

What happens, as you have the parachutes floating down and when the first submunition goes off, it creates a shockwave and that shockwave affects the parachute of the second one and it tilts the submunition a bit.

When the second one hits it in a tilt, it ends up firing one slug higher than you like and another slug into the ground. So, they are looking at how to stabilize parachutes and how to fix that so that it won't happen. The concept is good and we believe that is a minor problem, but before we go into production with the chutes and all we want to make sure that it is right.

The second part, of course, is the Wasp, which is a kind of minimissile fired from a pod. You can see some of them here in the artist's conception. They are fired out in front of the airplane. They have a millimeter wave-seeker. When it picks up a tank or truck it goes down into it.

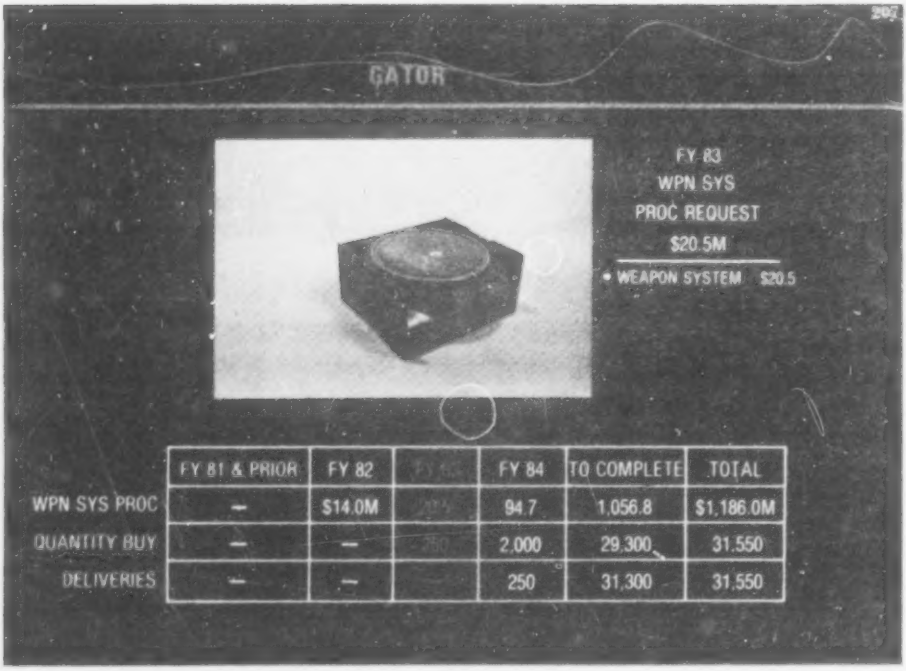

201
WIDE AREA ANTI-ARMOR MUNITIONS
FY 83
RDT&E REQUEST
$8.5M
• SYSTEMS ENGR $4.2
• TEST 2.5
• OTHER 1.8
FY 83
WPN SYS
PROC REQUEST
$54.4M
• SUBMUNITION $30.4
• DISPENSER 11.8
• OTHER 12.2
FY 81 & PRIOR | FY 82 | | FY 84 | TO COMPLETE | TOTAL
RDT&E | $20.8M | 20.7 | | 45.7 | 312.8 | $408.5M
*WPN SYS PROC | | 16.0 | | 164.0 | TBD | TBD
QUANTITY BUY | | | | 7,200 | TBD | TBD
DELIVERIES | | | | 2,000 | TBD | TBD
*ANTIARMOR CLUSTER MUNITION (ACM) ONLY

The moneys that we have in this are all these moneys and these numbers are for the ACM munition. The Wasp is in research and development and it will be down the road a piece.

The Gator is an air-delivered land mine. It will also fit in our tactical munitions dispenser as indicated on the pod on the F-4. This is a triservice program, in that the Air Force is the lead for the design and test. The Army actually makes the mines. The Navy makes part of the connections that allow the munition dispenses to fit on the aircraft. It contains two types of mines; it contains an antiarmor mine and it contains an antipersonnel mine.

The antiarmor mine is a magnetic mine. As the tank rolls over it it sends a fragment up under the soft belly of the tank.

The antipersonnel mine, as the munition itself lands it sends out little wires and anybody who comes in contact with any of thse wires sets off a personnel mine.



	FY 81 & PRIOR	FY 82		FY 84	TO COMPLETE	TOTAL
WPN SYS PROC	—	$14.0M		94.7	1,056.8	$1,186.0M
QUANTITY BUY	—	—		2,000	29,300	31,550
DELIVERIES	—	—		250	31,300	31,550

We will make a production decision this year and we will buy our first 250 of them in 1983. This is the only mine we will have in the inventory to drop from the air. We currently do not have any mines that we can drop from the air. That was a major concern of the Army as well as the rediness command, that we attain an air delivered mine capability. We have been working on this for quite a few years and it is ready to go at this time.

Senator GOLDWATER. Can that be released at low level?

General RUSS. Yes, sir. The way it works is that the munitions dispenser comes down, then it opens up and it scatters the mines in a big circle. You can toss it or you can drop it; you could drop it straight and level at [deleted].

Senator GOLDWATER. That is pretty much the same as the one that SAC had a number of years ago, is it not? It is a tumbling device?

General RUSS. Yes, sir; it is similar to some of our other cluster bomb units which we had, the dispenser would spin. You lay out a certain pattern on the ground and how fast the dispenser spins and at what altitude it opens up allows different patterns on the ground.

As you recall, in Southeast Asia we had some that had a radar fuse to go for SAM sites and we dropped those. When that certain fuse operated they would break open and you would have a so-called doughnut coverage on the ground that would just circle the SAM sight.

Our next program is Lantirn. In the Lantirn program it has basically three elements: We have the wide field of view head up display. We have a navigation pod which has a FLIR in it, and a terrain-following radar, and we have a targeting pod which also has a FLIR in it, a laser, a missile boresight correlator, and growth provisions to put in a target recognizer.

This is what we talked about yesterday, to give night attack ability on the F-16 and the A-10. Currently we are planning to buy some 300 of these pods.

BASED ON INDEPENDENT COST ANALYSIS JUL 81
UPDATED TO REFLECT FY 83 PRESIDENT'S BUDGET REQUEST

	BASE YEAR (FY80 $)	THEN YEAR $
•UNIT FLYAWAY	$1.5M	$2.6M
• RECURRING AND NON-RECURRING FOR 2-POD SET		
•UNIT WEAPON SYSTEM	$1.9M	$3.3M
• UNIT FLYAWAY +POD SUPPORT EQ +FACTORY TRAINING		
•UNIT PROCUREMENT	$2.5M	$4.5M
•UNIT WEAPON SYSTEM +DEPOT SUPPORT EQ +INITIAL SPARES +PUBLICATIONS		
•UNIT ACQUISITION	$3.8M	$6.1M
• UNIT PROCUREMENT +TOTAL R&D FOR PODS, TEST, A/C INTEGRATION, HUD, AND SUPPORT EQ +TARGET RECOGNIZER R&D AND PROCUREMENT		

Yesterday we discussed costs on Lantirn. I thought it would be useful to go through this chart here and maybe explain it a little further:

As you recall, you asked me about the $6.1 million. Let me show you all of the costs that come out because everyone talks around a different number. The unit flyaway; that is, recurring and nonrecurring, just the buy for the two pods—in base year dollars is $1.5 million; escalated to then-year dollars it is $2.6 million. If you take a two-pod set and add support equipment and factory training, you get these types of numbers.

Then if you add to it depot support equipment and initial spares and publications, you get this sort of number.

Then if you add to it the total R. & D. cost for the pods, the tests, equipment, aircraft integration, R. & D. for the HUD and for the support equipment and the target recognizer for the research and development and procurement, then you get to these numbers. So, this is an all-inclusive number of every possible thing that you could throw into the pod program.

The number I gave you yesterday was around $2 million for unit weapon system cost in base-year dollars, but I think this will help clear up where we are on the dollars. Certainly that is not a small number.

Senator GOLDWATER. We are not spending base-year dollars.

General RUSS. Yes, sir; that is true.

Senator GOLDWATER. How far into production are you now on that?

General RUSS. We are not in production, sir. We are still in research and development phase. We will have our first production pod in the latter part of 1985. We will actually have full-scale testing with the pod and all that next summer.

Senator GOLDWATER. At precisely what point are you now in the development? Do you have it all in the airplane?

General RUSS. No, sir. We have the various bits and pieces that go into it—the laser, the FLIR, the radar—all of those are being tested individually. They will be integrated into a pod and flown together next summer.

Senator GOLDWATER. Who else is working on this besides Martin Marietta?

General RUSS. Martin Marietta is the prime contractor at this time. We also have Hughes working on the target recognizer. Martin Marietta won the contract to develop the pods; however, the target recognizer part of the pod, which we believe is the higher risk, has been separated and put in advance development and that is being competed between Martin Marietta and Hughes.

Senator GOLDWATER. Are there other companies that could get into this competition?

General RUSS. Probably the most likely candidate is Ford Aerospace. Ford Aerospace is the prime contractor for the F-18 pod that the Navy is procuring. They were in competition with Martin Marietta for the Air Force contract and the Air Force Selection Board picked Martin Marietta rather than Ford Aerospace.

Let me say that the guidance that Congress gave us last year from the authorization committee was to do three things: The first thing was to take the target recognizer and put in back in advanced development. We have done that and that is in a special line now, off by itself. The reason for that is because that is a higher risk and they felt it was better to put it down there until it was proven.

A second thing they asked us to do was to look at the F-16 radar and see whether there is some way that that could be modified to give us a terrain-following capability. We are also doing that in the B-1 line. As you know, the B-1 radar is basically the same radar as the F-16 radar; therefore, we are looking at time sharing the radar in the B-1 to give us terrain-following capability.

So, we are actually doing that, too.

The third thing that the committee requested was that we conduct a competitive hardware competition between LANTIRN and either the F-18 pod or a derivative of the F-18 pod. Currently we have looked at that. General Creech is talking to Ford Aerospace people next week. We had a meeting last week and the Air Force is prepared to compete for production the pod system of the LANTIRN versus the Ford Aerospace pod.

Senator GOLDWATER. Do you know that the Navy is going to pay for their pod?

General RUSS. No I don't know, sir. I don't have that figure.

This runs down the dollars. Most of the money is in research and development with a little bit of the money for production readiness in the procurement account.

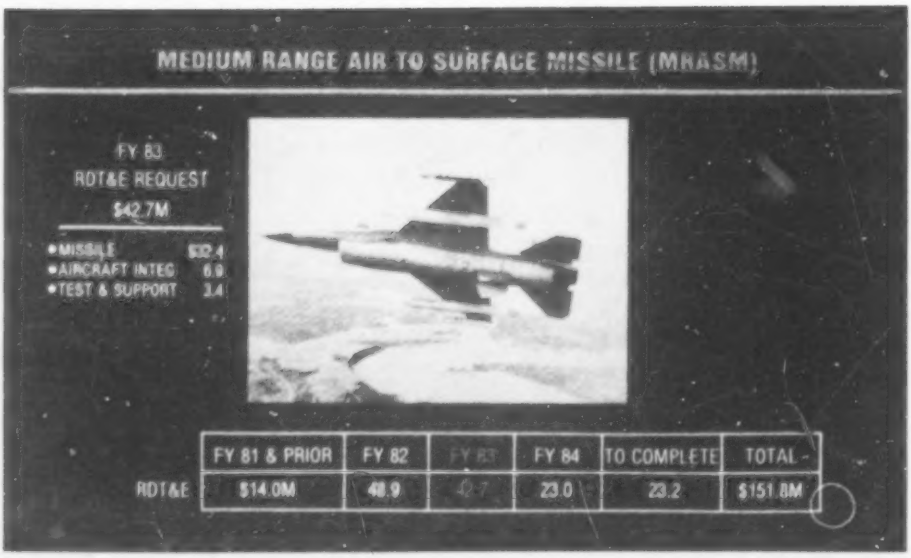
The MRASM is an air-to-surface missile that will allow us to attack high-value targets from standoff ranges. We are building it based on previous crusise missile technology. It is a joint Air Force/Navy program. The Air Force is primarily interested in a weapon that will attack runways, as the artist's conception shows, on the left (picture deleted).

The MRASM will fly down the runway and various submunitions will be dispensed from the weapon and blow holes in the runway. It is about two-thirds common with the Tomahawk missile. The structure is about 90 percent common and it has the same guidance system, TERCOM, and DSMAC fuel systems, radar altimeter, those sorts of things.

The submunitions are under test at this time. We are really looking at four types of submunitions: The Livermore Lab has one of the submunitions. Eglin has developed what they call a kinetic energy penetrator. The Germans have what they call STABO and the UK has the JP-233 submunitions. The two United States-developed munitions are underegoing tests now. The foreign submunitions will be receiving testing this summer and we expect to make a decision on which submunition we will put in the weapon.

It is important to first have the submunitions work, but it is also important that you get as many as you can into that one body.

With the Livermore Lab submunitions we can get 48 different small bombs in the MRASM, while with the JP-233 you can only get 15, so we hope to be able to get the most bang for the buck.



We are asking for $42.7 million in 1983 to continue the research and development.

Senator GOLDWATER. How have the submunitions test results been so far?

General RUSS. They have been mixed, sir. We have some good results on the Livermore Lab submunitions, but we also have some failures. The problem, is the size. it is about 114 centimeters across. It is a small sort of submunition which has to penetrate and go through the concrete. We believe to solve the problems we are having now that that may have to be scaled up somewhat. So we have had mixed results, certainly not good enough to make a decision. That is why we are looking at four different types of munitions.

General MARSH. reviewed it in February and decided that we weren't ready to make a decision on which one of the munitions is best, so he is going to wait until the August/ September timeframe.

Senator GOLDWATER. What does the pilot use for a fire-control system?

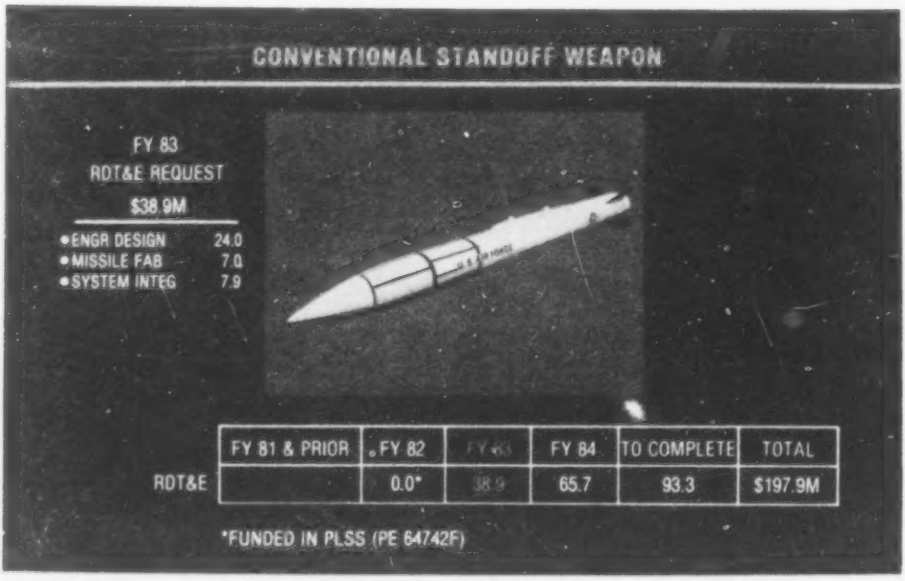
General RUSS. On the MRASM the coordinates and route of flight are preset in the weapon and all the pilot has to do is take it up to an area and let it go, and it will then go through terrain-matching correlation; it will go to the target, a similar capability as the ALCM has for our strategic force.

The conventional standoff weapon is another in a series of weapons that we are looking at for standoff capability. It is primarily going to be used with Pave Mover or PLSS systems. Basically what it will do is that an aircraft comes in, the Pave Mover platform will pick up moving targets, tanks; it will pass this information to the fighter. The fighter then will launch a conventional standoff weapon; while standing off somewhere between [deleted] miles from the target. When this weapon gets to the target area it will open up and its submunitions will kill the tank.

In essence, it is doing the same thing as we did in direct bombing the tanks, only it is giving us a standoff capability and we probably

will use the same source of submunitions, such as possibly Skeet or SADARM.

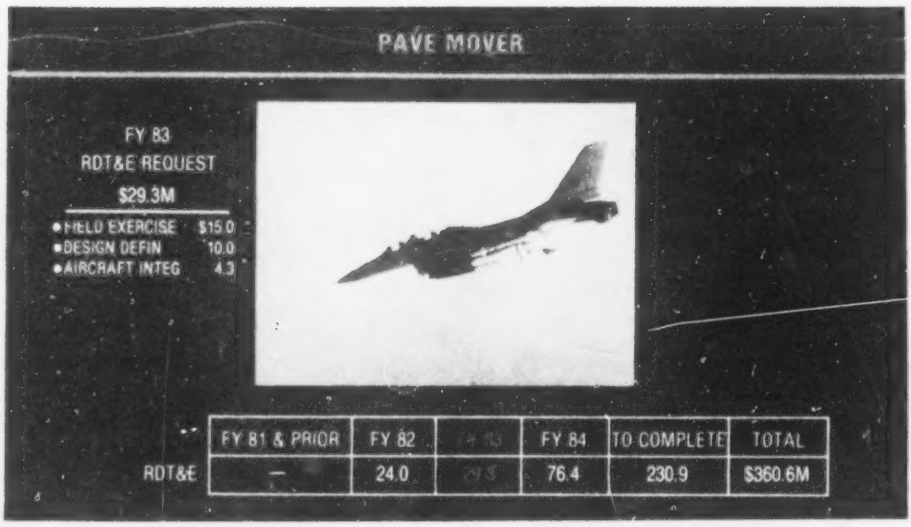
We have a competitive development award that we will award sometime in the latter part of this year. It appears that we have six potential bidders at this time. We are hoping for an IOC in [deleted]. It will then be available for use with our PLSS and Pave Mover.



This is how much money is involved, $38.9 million. We will have about $10 million in fiscal year 1982. We have reprogrammed some money, or we are in the process of reprograming some money, out of the PLSS line to do that. During the congressional testimony last year, the House side was concerned that we didn't have money in for this weapon. We told them that we would reprogram some money and get it started, and that is what we are doing.

The concept of this weapon is not an entirely new developed weapon; it is supposed to be bits and pieces of current technology that are off the shelf and put together. With someone's rocket engine that is already in being, someone else's airframe, someone else's guidance system, all put together in one package

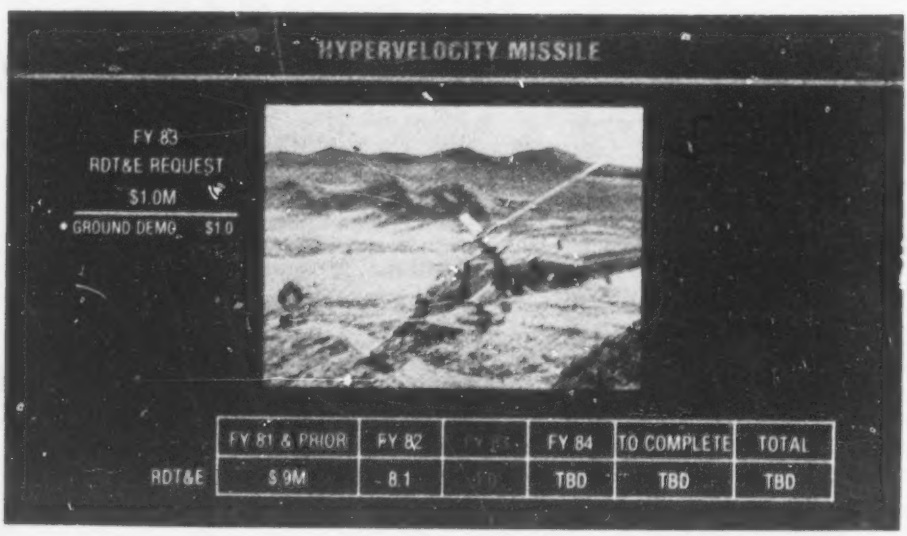
The Pave Mover is a system—and the artist's conception on the left shows it [picture deleted]—a 707 with a Pave Mover radar. The radar detects moving targets out to some [deleted] nautical miles. The concept would be for the aircraft to stand on our side of the battlefield, look in deep and survey what the enemy is doing for intelligence as well as for launching strikes, in either direct or standoff attack. We plan on using a 707 aircraft and modifying it with the Pave Mover radar. Currently we are testing with F-111's. This picture is supposed to be a picture of the radar and how it fits on the aircraft.



Again, $29.3 million to continue the effort on the Pave Mover. The vast majority of that is to run the exercises that I discussed for the F-111.

The hypervelocity missile is a small, 40- to 50-pound mach 5 missile that we hope to be low cost, on the order of $5,000 or less. It uses a kinetic energy penetrator versus the normal chemical energy warhead. We currently have one contractor working this for a demonstration. LTV is the contractor. We see that it has application for both the Air Force and the Army.

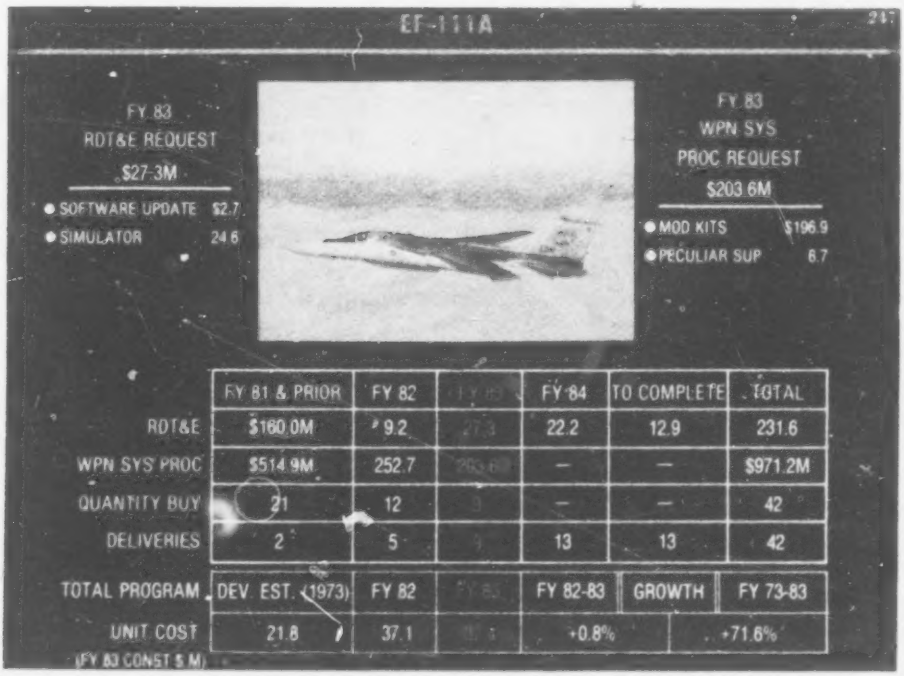
The Army is very interested in it. We will do this ground demonstration in 1982 and in 1983, and then subsequently we will do a 1984 demonstration from the air.



We have not programed money in 1984 at this point in time, primarily because we wanted to make sure it worked. We have been

criticized for not building a big line out here, but that is a high technology sort of system and we believe that we need to walk before we run, and therefore we are going to do a ground demonstration and after we do that ground demonstration we are going to fall back and see where we should go from there.

The next area is defense suppression, electronic warfare area.



	FY 81 & PRIOR	FY 82		FY 84	TO COMPLETE	TOTAL
RDT&E	$160.0M	9.2		22.2	12.9	231.6
WPN SYS PROC	$514.9M	252.7		—	—	$971.2M
QUANTITY BUY	21	12		—	—	42
DELIVERIES	2	5		13	13	42

TOTAL PROGRAM	DEV. EST. (1973)	FY 82		FY 82-83	GROWTH	FY 73-83
UNIT COST (FY 83 CONST $ M)	21.8	37.1		+0.8%	+71.6%	

First is our EF-111, which is a modified F-111A, which we use for standoff and penetrator jamming. The first production aircraft was delivered in November of 1981. IOC for the squadron is in 1983. This year we are buying the last nine modification kits for $196.9 million. That will give us a total force of 42 EF-111s.

Senator GOLDWATER. Grumman has that contract?

General RUSS. Yes, sir, they do.

Senator GOLDWATER. Haven't you had about a 70 or 71 percent cost increase?

General RUSS. Yes, sir, from the initial 1973 estimate. The major reason for that cost increase is that the program has slipped 3 to 5 years. It was 3 years and it slipped to 5 years. After we did the initial testing we were directed by Congress to go back and fix all of the deficiencies before we entered into production, rather than incorporate them into production, so we had to fix them and demonstrate them, and then go into production.

That slipped the program 2 years.

While there was cost growth and other things involved, that was one of the major reasons why we ended up——

Senator GOLDWATER. Could you offset that?

General RUSS. I am sure that will be very difficult to do.

Senator GOLDWATER. What does that bring the cost of the airplane to?

General Russ. The flyaway cost in 1982 dollars is about 24 million, sir.

Senator Goldwater. That is on top of the original cost of the aircraft?

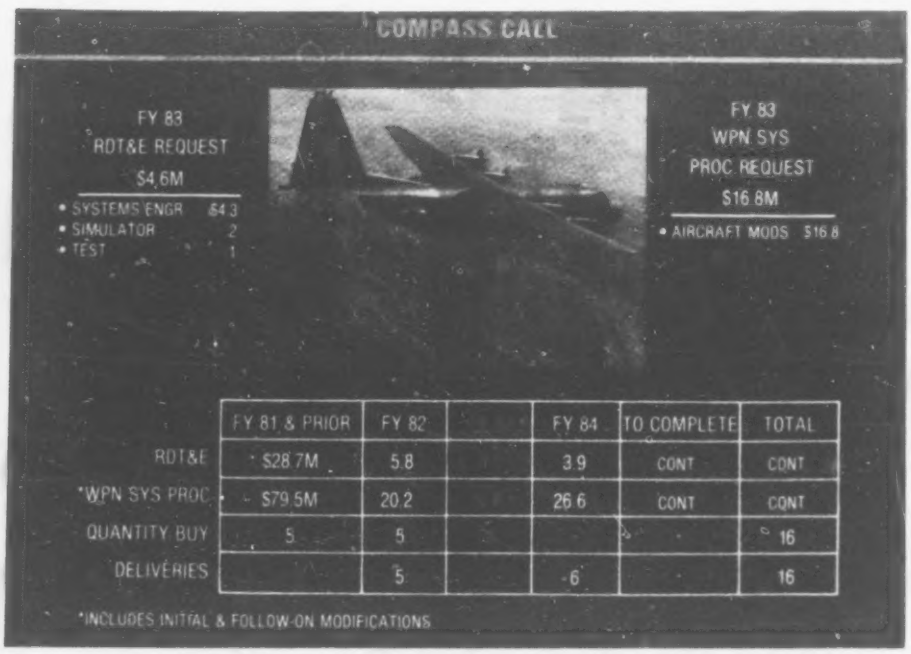
General Russ. Yes, sir. We also have a small amount of R. & D. money to update the software with some of the threat information and we are building a simulator. A simulator is needed because we really can't turn on all our jamming capability in the States because it would block out too many things.

Senator Goldwater. Are you satisfied with the performance so far?

General Russ. Yes, sir; we are very satisfied. We have used the airplane in Red Flag. We have used it on several exercises. We have two of them at Mountain Home at this time. Everyone has been satisfied with it.

One thing that is going to continue is this threat update. We are going to have to keep updating that threat as we get new information about the Soviets and hopefully we will maintain that system the way we should.

To provide ourselves a jamming capability to go against enemy [deleted] we have designed a modification that goes in our C-130.



We are currently going to modify 16 of these aircraft. The first aircraft will be completed this month and will be delivered to Davis-Monthan, where the squadron will be formed. We expect an IOC by the end of this year. The moneys that you see in the procurement are for the kits. We take an in-service C-130 and we modify it with various antennas and various jamming gear. It carries a crew of 15, the aircrew and 11 people in the back end.

It stands off from the forward edge of the battle area and jams most anything across the line.

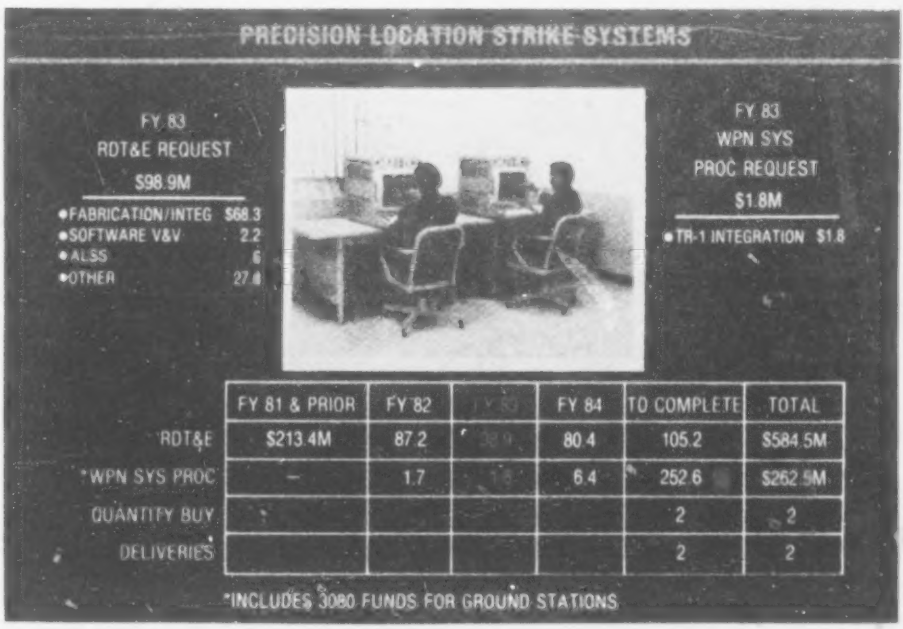
The precision location strike system is a system that I can best describe by looking at this chart [chart deleted]. We put up three TR-1 aircraft that have sensors in them that will pick up anything on the other side of the border that is radiating. Those three then triangulate and send back information to a central processing station. That central processing station processes it, locates all of the SAMs, all of the various search radars and threat radars, and provides that information back to the airplane, to strike aircraft, which then can go in and very accurately bomb the threat radar or they can launch a standoff weapon that is guided by the PLSS to the target area.

We have demonstrated this on a previous system which we call the ALSS, and we have demonstrated a guided weapon within [deleted] and an unguided weapon within [deleted].

Now, the TR-1 as you know, will also be used for reconnaissance. I have a slide on that and I will get into that.

By and large we have a changeable nose and when we use it in PLSS configuration we put the the sensors in the nose. When we decide to make it a reconnaissance aircraft, we take that nose off and put the reconnaissance nose on.

Senator GOLDWATER. How many TR-1s do you have in the inventory now?



General RUSS. Our first one is in, and we have another one that was delivered in January. We also have in our line some U-2s for other purposes that are not in this line.

We have had some problems previously with this program and it has had a kind of rocky history. I will say that we believe that it is on course now and it is not having any problems, either technical or financial problems. We fully expect to see it fielded by [deleted].

Senator GOLDWATER. How many have you bought?

General Russ. We have not bought any yet. These moneys here are for integration of the systems into the aircraft. We have to buy the ground stations. The processing station is about the size of two of these rooms. You put three vans in this room and three vans in another room. Those vans would be placed in hardened shelters in Europe. It could be back in England. It could be in Germany. Actually, we plan on having a forward one and an aft one, so that we have a redundant capability, either in a cave or hardened shelter.

All of the equipment is being designed and worked on but we have not actually procured any of the operational vans yet. We will expect to start that out in 1984.

In the ECM Pod line, we really do two things: We buy new pods and we update old pods. The one on the left over here is the 119 pod. This is the ALQ-131 pod (picture deleted). They are both made by Westinghouse. We have a requirement for some 2,600 pods for our tactical forces. That will cover all of our Active and Reserve Forces.

Currently we are short about 800 pods, so we are continuing to procure 131 pods. We are no longer procuring 119 pods.

Senator Goldwater. Could you supply the power requirement in that pod for the record?

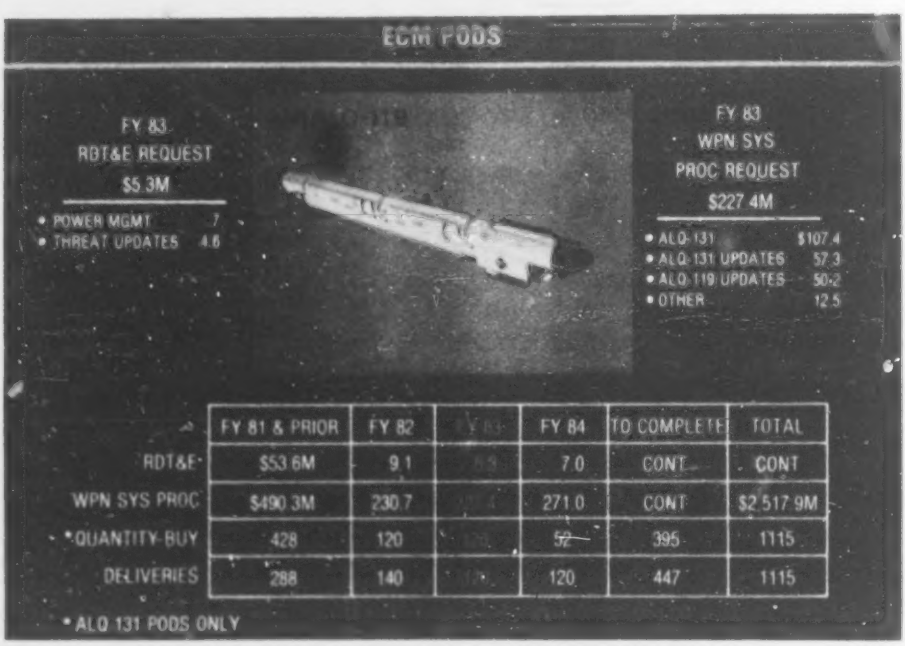
General Russ. Yes, sir.

[The information follows:]

POWER REQUIREMENT IN ECM PODS

The ALQ-131 ECM pod requires a maximum of 8.6 kilovolt-amperes (KVA) of prime power from the aircraft. The actual power consumed in flight varies with the ECM programs being used. Typically, the pod consumes 7.2 KVA with current wartime ECM programs.

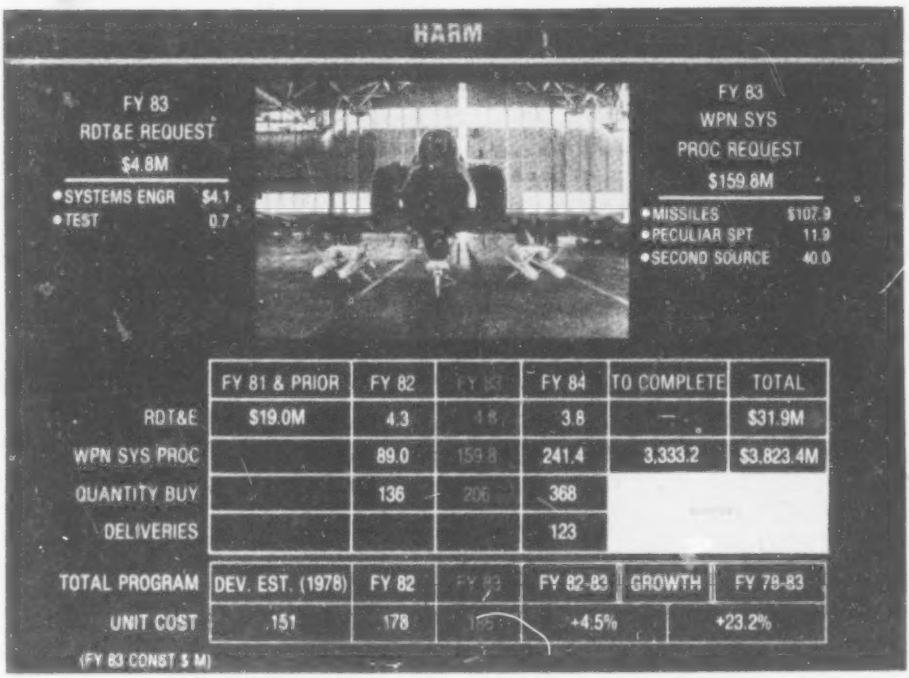
General Russ. Power and cooling is one of the bigger problems in developing t[illegible].



Looking here, you can see that we are buying 120 pods of the 131 type and then we are buying threat upgrades for the 131s, the 119s and some other minor training pods for the Air Defense Command.

I believe the Navy has discussed the high speed antiradiation missile with you, HARM. Since we are partners, I thought we would cover it. It is a primary ordnance for the Wild Weasel. They are going to depend on that weapon. It is a joint Air Force and Navy program, as you know, and we expect a production decision in 1982.

We have made a limited production decision in January and we expect full-rate production possibly in June of this year.

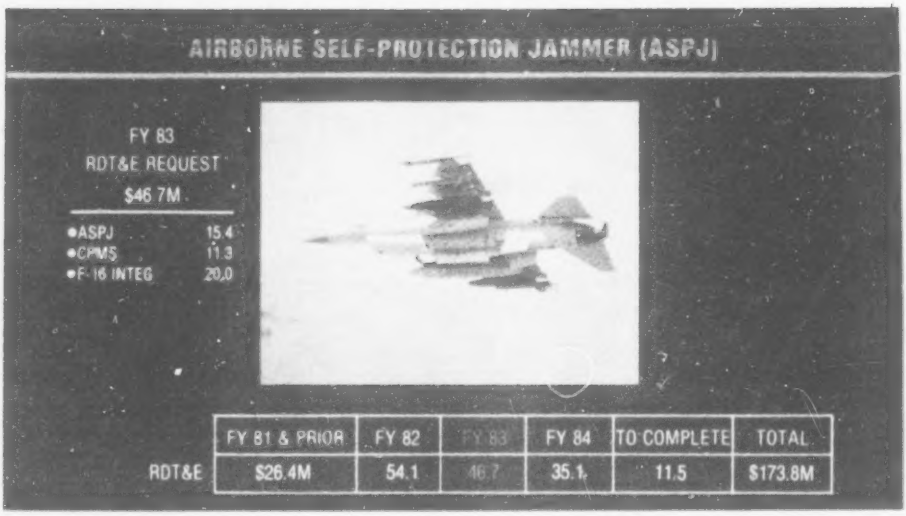


The total procurement is some [deleted]. You can see this just shows the Air Force portion of that. The Navy has a similar line and dollars for their budget. We have a small cost growth in 1982 to 1983. The Navy tells me that is primarily the result of estimating error. The total cost growth percent 23.2 is the result of program stretch-out, not an optimum production thing, and the fact that we have added money in for a second source. We believe that will pay off as we get out into the 1986–1987 timeframe.

It is important that we get that second source. The Air Force has funded $40 million for that in 1983.

The ASPJ, or airborne self-protection jammer, is another joint development effort between the Air Force and the Navy. The Air Force will use this common ECM system for the F–16. The Navy will put it in their F/A–18, F–14, A–6E, and EA–6B.

The diagram on the left shows where the bits and pieces fit within the aircraft. Once we have this in the aircraft we will no longer have to carry the 131 pods. As you know, carrying a pod adds drag count to the aircraft and reduces range, so hopefully this will be the answer to that problem.



In the research and development area CPMS is the comprehensive power management system. That is a part that will also be used to upgrade the 131 pods with a power management capability as we produce them.

Senator GOLDWATER. General, before you go any further, has the evaluation of the Rapport III system been successful?

General RUSS. Sir, the evaluation that the Belgians did on the Rapport system this past year was unsuccessful. By that I mean there were too may deficiencies and the Belgians were not willing to sign up for procurement, so they have asked the contractor, which is Loral in New York, to go back and fix the deficiencies and then they will test it again. They estimate that will be about a year before they get that done.

Senator GOLDWATER. It would be of great help for us if you would provide for the record a breakdown of what the deficiencies are.

General RUSS. We will be happy to.

Senator GOLDWATER. We get a rather unusual amount of pressure from certain people to buy that system.

[The information follows:]

EVALUATION OF THE RAPPORT III SYSTEM

The Belgian Air Force (BAF) with USAF assistance flight tested the Rapport III system at Eglin AFB, Florida from April 8, 1981 to March 8, 1982. The original BAF objective was to conduct an initial operational test and evaluation (IOT&E) leading to a production decision. Five contractor optimization flights to prepare the system for flight testing, followed by 48 evaluation flights were planned. After seven evaluation flights the BAF determined the RAPPORT III system was not performing to the BAF specification. The BAF informed the USAF (June 1981) that all previous and future flights until further notice would be classified as contractor optimization flights. Subsequently, the BAF informed the USAF that the purpose of testing at Eglin was changed to "identify existing system short-comings and possible solutions," not an IOT&E leading to a production decision as originally planned. They also requested that the final report be "written as a development test report."

The RAPPORT III system deficiencies identified during flight testing are in the following areas:

a. Receiver (results never varied significantly during the test).

1. Direction Finding (DF) accuracy.—Displayed threats in the wrong quadrant, i.e., indicated threat was located on one side of the aircraft when it really was on the other side. This also caused the system to jam in the wrong direction.

2. Range accuracy.—Reported threats at greater ranges than they actually were. The critical factor here is that the aircraft was already within the lethal range of a threat and the pilot was not aware of it due to the erroneous range indication.

3. Threat identification.—System tends to identify some non-threat radars as a threat, i.e., RAPCON (Radar Approach Control) and range control radar. This results in a false warning to the aircrew and cause the jammer to act as a beacon to the non-threat radar.

4. The receiver does not possess the capability to identify the complex signals employed by modern threat radars as electronic counter countermeasures. When the signal is not identified, it is not jammed.

b. Transmitter.

1. Jamming signal is placed at the wrong frequency. This results in the radar not being jammed effectively.

2. Jamming techniques have limited effectiveness against newer threat systems.

3. Effective radiated power is low. The jamming power radiated was not adequate at crucial ranges from the threat radars.

c. Maintenance.

1. At least one line replaceable unit (LRU) failed per flight. Flight duration was typically one and one half hours.

2. Pilot received many system failure warnings which could not be substantiated by analysis of the telemetry data.

The final test report will be published in about 90 days. The above identified deficiencies will be addressed in greater detail in this report and we will provide you a copy.

General RUSS. I might add that we have a letter coming over to Congress in answer to congressional guidance last year. As you will recall, the Congress asked the Air Force to procure a Rapport III system and test it in fiscal year 1982. That is impossible to do, in that there is a 16 month delivery date after we go on contract, so we could not get one in 1982.

Besides that, we are concerned that the Belgians have just tested the system and found out that it doesn't work very well, so we really see little utility in buying a system and doing the testing again, since we already know what it will do. Therefore, we believe it is prudent to go back and make those fixes and then allow the Belgians to come back and test it. We will test it with them when they do that.

The whole purpose of the Rapport III was to provide us an interim capability until this came onboard.

Senator GOLDWATER. When will this be onboard?

General RUSS. This will be onboard in 1986.

Senator GOLDWATER. What takes so long?

General RUSS. I wish I knew, sir.

Senator GOLDWATER. I would say we are equal to the Japanese in building this type of equipment. I have a strong feeling they could produce this in 6 to 8 months. I can't understand why is takes this country 3 or 4 years to build electronics equipment. I have been in this business all my life and can remember the days when you wanted something like this you did not wait 3 or 4 years; you waited 6 months or so at the very most. I can't figure it out. I know you don't know the answer either.

General RUSS. Now I would like to discuss our Other Tactical Air Forces.

The first is our E–3A, which as you know meets not only our tactical requirement but also our strategic CONUS defense needs.

We have 25 of the aircraft at the current time; 24 of them are the first block model; the 25th one is in the NATO standard configuration which has a larger computer and has a maritime surveillance capability in it.

Senator GOLDWATER. How does the maritime surveillance compare to the British Nimrod?

General RUSS. The Nimrod does not have the search area that we have and does not have coverage over land. We have the capability to do land and water. I don't know as a direct comparison which one would be better. We are very satisfied with the air-to-surface capability.

Senator GOLDWATER. Over water?

General RUSS. Over water.

Senator GOLDWATER. Are you getting a clear definition or are you still bothered with clutter?

General RUSS. There is some clutter problem, but we can pick out medium to small size ships in sea states [deleted]. We can distinguish larger ships in rougher sea states than that. We believe it is sufficient to track just about anything that is moving of any size or any quantity.

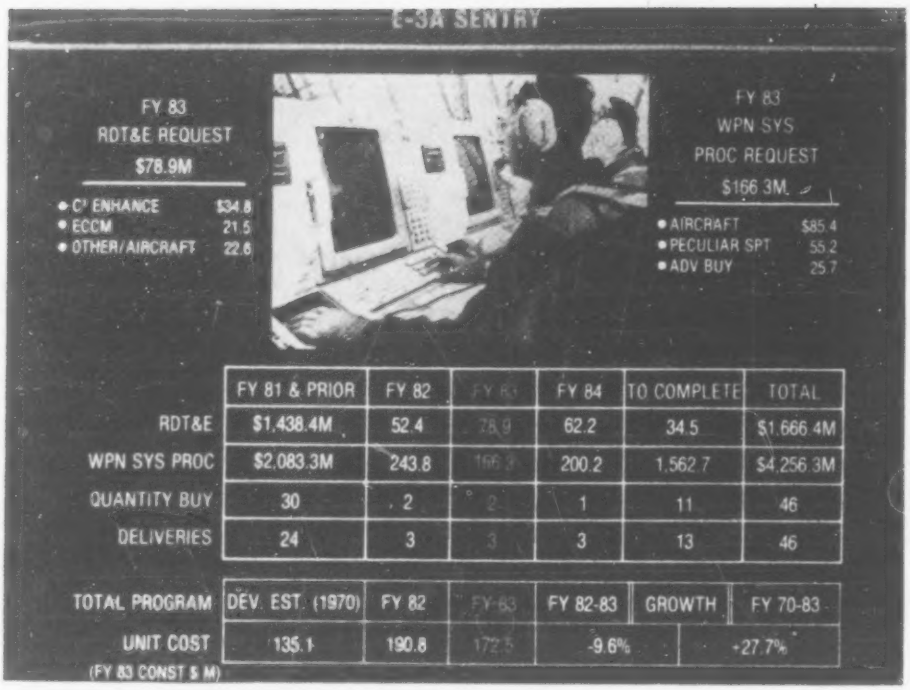
Senator GOLDWATER. Didn't the earlier models have a problem with that?

General RUSS. Yes, sir, they did have a problem because, as you know, the radar was designed to work over land; then when we went over water it just did not have the right mode. What you actually have in the aircraft is—and I am not sure how it works—a switch. When you go over the water you turn the switch and it changes the way the radar works over water. When you are over land you turn on the land switch.

Senator GOLDWATER. As I remember it, a C-121 had good sea surveillance.

General RUSS. When we designed this radar, as you know, the radome rotates about once every 10 seconds; we designed it to have a radar in this side and IFF capability on that side. I think the 121 had a full radar sort of thing that went around and had another system for the IFF.

Senator GOLDWATER. It wasn't rotating horizontally; it was rotating vertically?


E-3A SENTRY
FY 83
RDT&E REQUEST
$78.9M
• C³ ENHANCE $34.8
• ECCM 21.5
• OTHER/AIRCRAFT 22.6
FY 83
WPN SYS
PROC REQUEST
$166.3M
• AIRCRAFT $85.4
• PECULIAR SPT 55.2
• ADV BUY 25.7
FY 81 & PRIOR | FY 82 | FY 83 | FY 84 | TO COMPLETE | TOTAL
RDT&E | $1,438.4M | 52.4 | 78.9 | 62.2 | 34.5 | $1,666.4M
WPN SYS PROC | $2,083.3M | 243.8 | 166.3 | 200.2 | 1,562.7 | $4,256.3M
QUANTITY BUY | 30 | 2 | 2 | 1 | 11 | 46
DELIVERIES | 24 | 3 | 3 | 3 | 13 | 46
TOTAL PROGRAM | DEV. EST. (1970) | FY 82 | FY 83 | FY 82-83 | GROWTH | FY 70-83
UNIT COST (FY 83 CONST $ M) | 135.1 | 190.8 | 172.5 | -9.6% | +27.7%

General Russ. Yes, sir; it was down in the bottom.

We have increased the buy on the E–3A from 34 to 46, or an additional 12 aircraft. We will be buying them out through about 1988 or 1989. The buy is dovetailed in here with the Saudi buy; in other words, the Saudis are buying three in 1983 and two in 1984 and therefore we are just procurring one in that year, but we will get the rest of ours in the following year.

The overall cost has gone down between 1982 and 1983. That is a reflection of the fact that we have increased the buy and it spread the nonrecurring costs over a larger area. The total cost over the years has gone up. That is primarily the result of three things: One is that we put JTIDS in the aircraft; two, we gave it that maritime capability that we didn't have in the initial one; and, three, we put a larger computer in it.

The initial computer would only handle [deleted]; the new one will handle [deleted] which is really needed in the NATO environment.

Senator Goldwater. How does the Soviets' surveillance aircraft compare to this?

General Russ. My personal opinion is that it is a good 5 years behind ours. I think that they have a minimum capability, but the state of avionics and the state of microminaturization in some of the circuits that we have in the computer is still ahead of them. I know the difficulty we had on that 3–3A program developing it, because I used to work the program at Tactical Air Command. That is a very, very fine system.

I might say that we, are, in addition to all of the deployments that we had around the world, working hand in glove with the U.S. Navy and providing them data, and we have down links to the

ships. The CNO is very pleased with the capability that we have. It is a good joint-service program in that regard.

Now, the KC-10 tanker. As you know, we exploit the commercial aircraft development and we use a worldwide support system for the DC-10. We have six of them so far at Barksdale Air Force Base in Louisiana. We have increased our buy to 60. We initially had 12 aircraft. At one time we had 16 aircraft. There have been various other numbers back and forth. I think you understand the ups and down of the program.

KC-10A

FY 83
WPN SYS
PROC REQUEST
$790.1M

- WEAPON SYSTEM 528.8
- ADVANCE BUY 261.3

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
WPN SYS PROC	$674.1M	335.2	290.1	539.6	1,770.0	$4,109.0M
QUANTITY BUY	12	6	8	8	26	60
DELIVERIES	5	6	7	4	38	60

The Air Force has now settled on a 60 aircraft buy. I might say that the dollars that are indicated here for eight in 1983 is one way to buy the airplane. We are coming over with a package to the Congress to explain a different way to buy the airplanes by which we think we can save considerable money. Somewhere around $500 million, I think, can be saved if we do this on what we call a lot-buy concept. We believe we can do that, since we already have a contract with McDonnell Douglas. The contract is signed. It has an option to buy up to 60 aircraft at a given price and we get certain discounts on those airplanes.

As a matter of fact, we will get up to $20 million discount on airplanes in the latter years, so we believe that that contract ought to be executed this year. Therefore we are coming over to show you how we can probably change that profile to be able to give us this capability.

Senator GOLDWATER. Do you think there would be any savings if the Air Force purchased old DC-10's that are now available from the airlines and modify them?

General RUSS. No, I don't think so, sir. The reason I say that is because the majority of the airplanes, DC-10's out in the field that people want to get rid of, are the DC-10-10. This is the DC-10-30

which is a bigger airplane; it has the structural weight in it because it carries all the fuel.

I think it would be a difficult job to overhaul them. I don't see where we can get a better price than we are getting right now on these. We have a super contract on this airplane right now.

Senator GOLDWATER. How many pounds of fuel does this carry?

General RUSS. 350,000 pounds, as compared to a KC-135 of 190,000 pounds.

Senator GOLDWATER. 350,000 pounds. How many pounds of personnel and squadron equipment would it carry?

General RUSS. If you fully load it with fuel, then you have a reduced capability to carry cargo. It is a trade, depending on how far you want to go with the system. It gets quite complex. Let me give you one example and I think this will indicate what its flexibility is:

You will recall when we sent the F-15's from Langley to Saudi Arabia, we did that with KC-135's. It took 16 KC-135's; it took three C-141's; it took two C-5's to get the people, the airplanes and all that stuff to Saudi Arabia.

Senator GOLDWATER. Four squadrons?

General RUSS. No, one squadron; 16 C-135's, 3 C-141's, two C-5's.

Now, we could do that entire deployment with four KC-10's

Senator GOLDWATER. That is what I thought. You said the other day that you could do that.

General RUSS. Yes, so it is a very capable airplane. We are very pleased to get it into the inventory.

I mentioned the TR-1 has two functions.

Senator GOLDWATER. Let me go back just a moment to the KC-10. When will you make your proposal for the block buy?

General RUSS. There is in the Secretary of Defense's office at this time, sir, a letter coming to Congress. Let me say I was hopeful that it would have been here before I was, but it is not. I can only say it should be in the very near future.

Senator GOLDWATER. How does the $261 million in the procurement you are requesting fit into this new concept?

General RUSS. The new concept basically uses the $790.1 million in 1983. I can't tell you how it is broken out because I don't recall. It basically used $790.1 million and ends up buying these airplanes a little sooner than we did before. The overall savings will be, if my numbers are correct, about $500 million.

There is a series of options that the Secretary of Defense is looking at. I am not an expert on contracts but they have everything from delayed multiyear to fully funded multiyear to normal procurement, and I think there are eight various options they are looking at. The bottom line on all of it is to execute that contract before it goes null and void this fall. I think it would be a shame if we didn't have the foresight to do that.

Senator GOLDWATER. When do you think the Secretary of Defense will send it to Congress?

General RUSS. I don't know, sir, but when I go back, I will express your interest in it and see if we can't get it moving a little faster than it is.

Senator GOLDWATER. Will you let the staff know?

General RUSS. Yes, sir, I will.

[The information follows:]

BLOCK BUY OF KC-10'S

The package will be submitted as soon as it is approved by the Deputy Secretary of Defense.

The TR-1 serves two purposes: One as a surveillance system and the other as a reconnaissance platform. It is in production. We had our first airplane delivered in September. We expect to have the first deployment capability to Europe in [deleted].

Again, as I mentioned before, this nose comes off. We put in a new nose section. We also have a few boxes that we put in behind the cockpit. That changes the airplane from a PLSS airplane to a reconnaissance airplane.

Senator GOLDWATER. Do you have any performance figures on that aircraft?

General RUSS. It will fly at normally [deleted] at about [deleted]. It has a [deleted] mile range.

Senator GOLDWATER. I believe the old U-2 had a maximum G of about [deleted] and then it would come apart. How about this one?

General RUSS. The same thing.

Senator GOLDWATER. The wave action?

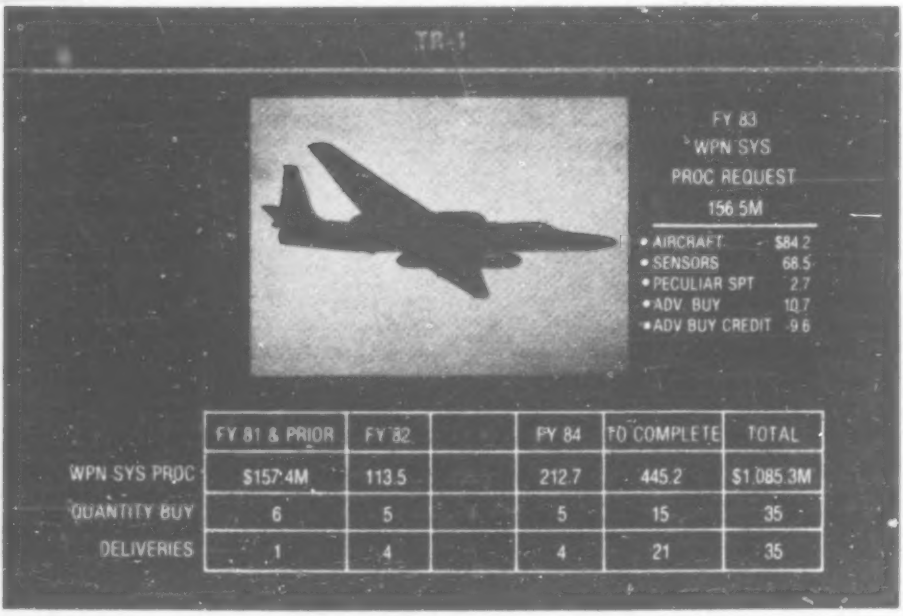
General RUSS. Yes, sir. You don't do much maneuvering at [deleted].

Senator GOLDWATER. It has the same landing gear as the U-2 had?

General RUSS. Yes, sir; it is an updated U-2.

Senator GOLDWATER. Where is this aircraft located?

General RUSS. At Beale Air Force Base.



	FY 81 & PRIOR	FY 82		FY 84	TO COMPLETE	TOTAL
WPN SYS PROC	$157.4M	113.5		212.7	445.2	$1,085.3M
QUANTITY BUY	6	5		5	15	35
DELIVERIES	1	4		4	21	35

We are now in negotiation with Lockheed on the 1982 buy. At Lockheed, the L-1011 production has stopped. The overhead is being spread and the cost of our TR-1 has gone up. We are very

concerned, so we are currently in negotiation with Lockheed to see what we can come up with.

Senator GOLDWATER. Why should the TR-1 go up just because they lost money on the 1011's? That is not our fault.

General RUSS. No, sir; it is not. It is not the fact that they lost money on the 1011; it is the fact that they still have that same overhead superstructure of all the presidents and vice presidents that they continue to pay and therefore if you only have one program going you absorb all of that overhead. If you have two or three or four programs going, it is divided and each program takes a little bit of it.

Senator GOLDWATER. Can't we tell them we don't like that?

General RUSS. That is exactly what we do, sir. We tell them if they only have one program going, then they ought to lay off some of those highly-paid executives and cut it down. Certainly, if you had four programs you would not cut in fourths. We recognize you have to have a president and have to have the open the shop kind of cost. We don't believe we should pick up the tab for it.

Senator GOLDWATER. I don't and I don't think the Congress will like it either.

F-5

FY 83
WPN SYS
PROC REQUEST
$28.5M

- AIRCRAFT $25.0
- PECULIAR SPT 8.3
- ADV. BUY CREDIT -4.8

	FY 81 & PRIOR	FY 82		FY 84	TO COMPLETE	TOTAL
WPN SYS PROC	$7.0M	23.0		49.0	—	$107.5M
QUANTITY BUY		3		5	—	11
DELIVERIES				4	5	11

General RUSS. F-5 Aggressors—As you know, we use these for our training for our dissimilar air combat training. It provides realistic training for our fighter forces. Over the years we have crashed some of these airplanes. It is getting down to the point where we need to fill up our force. We are buying a total of 11 of these aircraft to flesh out the force, three in 1983. We purchased three in 1982, the final five in fiscal year 1984. These are the E and the F models. These are not G's. The F, of course, as you know, is the two-seater. The E is the single-seater.

Senator GOLDWATER. It is a very fine fighter airplane. Have you ever been tempted to put it into our fighter forces?

General RUSS. No, sir, I have never been tempted to do that. I have gone out and flown it and I like it. It is a lot of fun to fly. If I had to fight across the street, I would probably think it was great. Our Air Force, as you know, required long-range airplanes because of the geographical situation as well as our mission. It is just not the type of airplane that would do the job for the U.S. Air Force. I think it is an excellent trainer, and it is an excellent type of airplane for foreign military sales.

Senator GOLDWATER. Does it perform like the Mig series?

General RUSS. Yes, sir; it does, the earlier versions. It is a good surrogate for the Mig-21.

Senator GOLDWATER. I have flown it at Nellis several times. It is a fine aircraft. What about the F-5G, do you have any plans for that?

General RUSS. Sir, we currently do not have any plans in the U.S. Air Force for the F-5G. There are currently efforts ongoing to select one fighter for export version; in other words, either the F-16 with a J79 or the F-5G. One of those will be selected as the export fighter, if you will. They hope to have that selection done by October 1 of this year and then procure some of those aircraft.

Senator GOLDWATER. When is the G going to fly?

General RUSS. September 1982, sir.

Senator GOLDWATER. Have you built any more range into it?

General RUSS. Let me say, yes, a little bit, a little bit more performance than the F-5E, but the ones that are coming off the line, I should say the first ones that we call the F-5G1, will not have the avionics, will not have a beyond-visual-range missile; it will basically use the avionics that is in the current F-5.

Senator GOLDWATER. Who is going to make the FX selection?

General RUSS. Currently I think it is the intent that the Air Force be directed to make that selection.

Senator GOLDWATER. You don't have anything else, do you? You have the F-16.

General RUSS. I think the two candidates are the F-16 with the J79 engine and the F-5.

Senator GOLDWATER. Do you think the Air Force can afford to let the F-16 go to the other countries? Don't we need them for our inventory?

General RUSS. Yes, sir. I would not envision that these F-16's would be coming out of our pot. I would hope they would be airplanes above and beyond the number we are procuring. The intent of this selection would be to use the fund which was authorized by Congress last year to allow us to buy some things for foreign military sales. The idea would be to buy 20 F-16's with J79 or 20 F-5G's and since the leadtime is a couple of years, 2 or 3 years by the time they get them going, we would have that process started and then as the State Department negotiates and foreign military sales develop we would have them onhand, and we could sell them, and we would not have to get into the Air Force's pot and say, "Gee, we need F-16's," and pull them off the production line and we go short.

I think in that vein it is an excellent idea and hopefully it will protect the airframes that we have.

Sometimes not too glamorous a subject but a vital one is our aerial targets. We have two types, the full-scale types, full-scale drones, such as the QF-102, and the QF-100. We also have the subscale; BQM-34, which is used by the Air Force and the Navy.

Senator GOLDWATER. Are those made by Ryan?

General RUSS. Yes, sir.

Senator GOLDWATER. How many 100's and 102's do you have left for drones?

General RUSS. I am not sure of the total number of 102's we have left. We bought 182 total. I will have to let you know, sir.

Senator GOLDWATER. You can supply it for the record.

[The information follows:]

F100'S AND F102'S FOR DRONES

There are 70 PQM-102 targets left. There are 9 QF-100 targets for development and initial operational test. The contract for the first 21 production QF-100's was awarded 26 February 1982. First delivery will be in April 1983. Production of a total of 300 QF-100 targets is planned.

General RUSS. This is the MQM-107 which was developed by the Army. We hope in the future to replace the 34 with this model.

Senator GOLDWATER. Why does the Army need the drone?

General RUSS. They use if for their surface-to-air missile firings. We have a joint program there. There is no sense in our developing our separate drones; they came up with a good one there.

Senator GOLDWATER. What altitude can that go to?

General RUSS. 50,000 feet. It can go about 500 knots; it is launched from the ground; it flies about 45 minutes.

Senator GOLDWATER. It can be manuevered from the ground?

General RUSS. Yes, sir; it is radio-guided.

Senator GOLDWATER. Thank you.

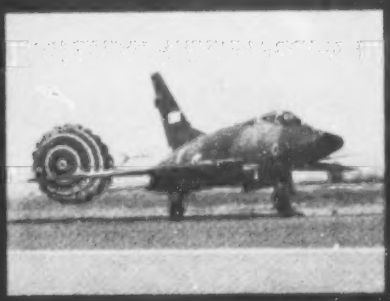
General RUSS. If you get down to Tyndall sometime, sir, you might want to stop and see how they control that new drone.

Senator GOLDWATER. I have seen it.

AERIAL TARGETS

FY 83
RDT&E REQUEST
$13.9M

- FIREBOLT $9.5
- TARGET PAYLOAD SYSTEM 4.4



FY 83
WPN SYS
PROC REQUEST
$40.2M

- BQM-34A $11.3
- MQM-107 9.1
- QF-100 19.8

	FY 81 & PRIOR	FY 82	FY 83	FY 84	TO COMPLETE	TOTAL
RDT&E	$38.1M	12.3	13.9	14.2	CONTINUING	CONTINUING
WPN SYS PROC	$4.5M	18.4	40.2	44.4	CONTINUING	CONTINUING
QUANTITY BUY		21	120	88	CONTINUING	CONTINUING
DELIVERIES				103	CONTINUING	CONTINUING

General RUSS. This picture represents the full scale drone. If you look closely, you will see there is a pilot in that cockpit, but I could not find one on the runway that did not have one in it.

Senator GOLDWATER. That is the way you lose pilots.

General RUSS. We are buying 50 of the 34A's. We are buying an initial 42 of the MQM-107's and 38 of the QF-100. There are no longer any F-102's to modify, so now we are going into the F-100 modification. This is continuing because as long as we have airplanes flying we are going to continue some sort of procurement of drones. I might mention one other thing. This $9.5 million under the R.D.T. & E. request is to get the development of our high altitude/high speed tgarget which is what we call the HAHST. That will be used by the Air Force and the Navy. The Navy will probably be the first one to procure that in 1984.

Our advanced tactical reconnaissance system is a line in the budget. The idea is to replace our aging RF-4C's, our reconnaissance plane. This is a picture, an artist's conception (deleted), of an F-16 made in the reconnaissance version. That is not what we are looking at but to be perfectly frank, Senator, I could not find a picture of what I wanted.

What we are looking at is a pod that fits on a current F-16 or a pod that fits on a current F-15.

Senator GOLDWATER. You don't have much ground clearance for that rascal?

General RUSS. No, sir, we don't. I am sure the artist who drew that picture never has flown an airplane or he would not have put that pod that far down on it, or we would have put an A-4 gear on it.

The idea is that you take a current F-15 or current F-16 and develop the pod. You use the sensors that are currently available; you put them in a pod and you hang it on an airplane. It can fly a reconnaissance mission in the morning. When it comes back in the afternoon and we want to use it as a strike fighter or something

else, we can drop the pod and it can do the other mission. The major reascn we are looking at that is, as you know, we got our first RF-4 in 1963; by the end of the 1980's they will be pretty old and fragile.

We are looking at $4 million in 1983 to do some integration work, some sensor pod studies and some trade studies.

Senator GOLDWATER. Has the Air Force evaluated the Navy's Tarps?

General RUSS. That is part of the effort here. We believe our initial studies indicate that the same sensors in the TARPS pod will probably go in our pod. Our pod will be different because of the way it mates on the airplane. The McDonnell Douglas pod is just a conformal tank they already have on the airplane. They use the front part of that conformal tank and put the sensors in it. The back part carries fuel. So, if it were an F-16 we would have to buy a different pod. The commonality would be in all the sensors that go into it. It is packaged a little bit differently.

Senator GOLDWATER. Does that conformal tank have room for avionics in it?

General RUSS. What they do is baffle the tank; they put a baffle in the front part of the tank; they can still carry quite a bit of fuel in the back end. In the front end they put a window in the bottom of it.

Senator GOLDWATER. The tank can't be any wider than that, can it?

General RUSS. It is about that big, sir. As you know, it comes down like this. They have designed a way to put in the sensors. We are talking about current sensors; we are not talking about designing and building other kinds of new sensors. We are talking about the sensors the Navy and the AIR Force use today or are going to be using in the next few years, putting those into an airplane, using the current airframe and moving on with it.

Last year this was cut out of the budget. We hope that Congress sees their way this year to give us that $4 million so that we can get on with this.

The combat helicopter—the program is designed to give us a night-adverse-weather combat helicopter capability. We use the Army UH-60 and we modify it for search and rescue and special operations. By that I mean, we put a hoist on it to pick up people. We put on some external fuel tanks to give it some more range. We put an inflight refueling capability on it to be able to ferry it and get it where we want to get it. It has commonality with the Army and the Navy version. We are looking for this version, which is the HH-60D in 1986.

COMBAT HELICOPTERS (HH-60D)

FY 83
RDT&E REQUEST
$32.3M

- ENGR DESIGN $14.2
- ACFT MODS 7.0
- TEST 3.4
- OTHER 7.7

	FY 81 & PRIOR	FY 82		FY 84	TO COMPLETE	TOTAL
RDT&E		18.8		18.0	20.9	$90.0M
WPN SYS PROC	27.0	33.0		55.9	TBD	TBD
QUANTITY BUY	5	6		4	TBD	TBD
DELIVERIES		5			TBD	TBD

As you know, we have bought 11 UH-60A's already, which are the ones that do not have all the modifications to them. By the time we get over here, we will have the full modifications in the aircraft.

Senator GOLDWATER. That is a very fine helicopter.

General RUSS. Yes, sir. I flew that helicopter. I could not believe what it could do on one engine; it just boggles the mind.

Senator GOLDWATER. I never forget the first time I flew it. The IP said, "Let us split S". "Roll it over." Well, it is their airplane. It did a beautiful job.

General RUSS. It is a different feeling, pulling three or four G's in a helicopter. Normally a helicopter does not pull G's.

Senator GOLDWATER. It shakes you up.

General RUSS. This is one of our high priority projects; it not only replaces some of our older helicopters which are very difficult to maintain, as evidenced by several exercises that we are all well aware of, but also it fills in a void in the shortfall of the total force that we are acquiring. We do not have sufficient helicopters in the

rescue and recovery service at this time to fly all the people that we have.

Senator GOLDWATER. Why aren't you procuring a few of those in 1983?

General RUSS. That is a good question. I certainly would like to. When we went through the negotiations getting these, there was a problem at that time with what the Army buy was going to be in 1983. The Army was going to use up the total buy. They ended up not using the total buy, but at that point in time we had already put the budget to bed.

Senator GOLDWATER. They are buying 96?

General RUSS. Yes, sir. I think the plant capacity is up to 144 aircraft now. The Navy is buying their version of it and the Army is buying their version of it. We just tag on to the Army buy.

We MIPR our money over to the Army and tell them to buy so many. If there are some available in 1983, we would like to do that, rather than cause that drop.

The next generation trainer is the airplane to replace our T-37 aircraft. We have gone out with a request for proposal. We have five contractors that have bid—Cessna, Fairchild, Rockwell, Gulfstream, and Ensign.

The source selection board is in negotiation, or I should say, reviewing all the data at this time. We expect a decision on which contractor wins in a month or so.

We will buy 650 of these trainers and replace all of the T-37's we currently have.

Senator GOLDWATER. As you probably know, Gulfstream American has alleged that their proposal is not receiving a fair hearing. Their proposal to supply off-the-shelf aircraft which the Navy is providing certainly is unique. Would you comment on this competition?

General RUSS. I will say what I can, sir. The reason I am a little hesitant is because they are in source selection and it is source se-

lection sensitive data. I don't really have access to all the data. I do know that the initial reply that Gulfstream came in with did not answer what the Air Force asked them to do; in other words, when the Air Force sent out their request for proposal, they said, "Please cost for us your airplane and do these things, then if you want to do something different, a different proposal, that is fine, tell us what you want to do differently." Gulfstream did not answer the first group. They said "We don't like the way you want to do it; we are going to do it a different way."

The problem that gives us is, how then do you compare their proposal versus all of the other four contractors who did come in and answered the mail?

The Secretary of the Air Force is now reviewing that to see how that can be done. I think there are really two alternatives: One is to disallow the Gulfstream bid. That would be one alternative. The other alternative would be to go back out to the other four contractors and say "Gulfstream proposed this and did not meet the standards; you have an opportunity to do the same sort of thing." That is a problem.

Senator GOLDWATER. What you are saying is that it is impossible to buy off the shelf?

General RUSS. It is not off the shelf, sir; they are designing and building a new airplane, just like anybody else.

Senator GOLDWATER. They have not built it yet?

General RUSS. No, they designed and built a single-seat version. They wanted to take it to the Paris Air Show and the FAA would not allow them to do it. They have a new one. Here it is here. That is the one they flew; it is a single-seat, single engine. The specs say two seats, two engines. They did not intend to sell us that one. They intended to build a new one, but they have not built that airplane yet.

Senator GOLDWATER. On performance, what are you driving at?

General RUSS. We are asking for about 2.5 G capability at 25,000 feet. We are asking for 1½ hours formation flight at 15,000 feet and then be able to come back and divert to a 300-mile alternate. We wanted to cruise up to about 35,000 feet for crosscountry and for strange field landings. All of these airplanes will do that.

Senator GOLDWATER. That would be about 0.8 mach?

General RUSS. I think it will be a little less than that. We are asking for somewhere between 1,000 to 1,500 pound thrust engines. It will have two of them, depending on the thrust/weight ratio; I imagine it will be .5 mach, in that vicinity.

The second part of our training package is the tanker/transport/bomber training system. Here we are going back to the way we did business when I went to flight school, where fighter pilots went through one track and bomber transport pilots went through another track, but both started out and went to primary training, and then you split off and went to your specialized training.

The Air Force has reviewed that; it is the way the Navy is doing it. We believe that is probably the best way to do it. About half of our force goes to fighters and half of it goes to bomber/transport. Since our T-38 is an excellent airplane to continue to fly our fighter pilots, we can keep the T-38 flying fighter pilots to the year

2000 if we bring in an airplane like this and allow it to fly our bomber and tanker pilots.

Senator GOLDWATER. They have made a very unusual proposal, have they not? Instead of selling the Air Force these aircraft, they lease them for eight years and then they become property?

General RUSS. There are various proposals on whether we want to buy or lease. We are really just getting started on this program. A lot of the ideas on these aircraft are brochuremanship, if you will, right now. We don't have any firm proposals from anyone.

Senator GOLDWATER. Do you know if the Air Force is looking favorably in that direction?

General RUSS. I know that is one of the things we are going to evaluate—whether it will be prudent to lease airplanes for this or whether it will be better for us to buy airplanes.

Senator GOLDWATER. As I understand this aircraft, you can put different noses on it and can train a man to fly. He gets his instrument and night qualifications and then with just a slight change he can be flying a B–52 or a 141 type of aircraft. You are teaching him to fly either jet or a larger aircraft. That makes sense.

General RUSS. Yes, sir. We think this is a very logical way to go. We have looked at these types of airplanes to train tanker, transport and bomber pilots. Each one of those will be a proposal. We think we can get something like this in about the $3 million range off the shelf, no R. & D., except we will put Government radios in them so that they handle the standard avionics that we handle when we get on the airplane.

Senator GOLDWATER. Do the proposals that have been made include maintenance?

General RUSS. The only proposals that we have, sir, are initial contacts that the Air Force has done with different companies. We have not had anything formal come in, but some of the companies are thinking that they will provide maintenance for us. Once we go out with a request for proposal, we would expect that they will bid blue-suit maintenance or another maintenance and we will make a choice.

TANKER, TRANSPORT, BOMBER, TRAINING SYSTEM

FY 83
RDT&E REQUEST
$0.6M

- RFP PREPARATION $0.4
- SOURCE SELECTION 0.2

	FY 81 & PRIOR	FY 82		FY 84	TO COMPLETE	TOTAL
RDT&E	—	—		1.6	2.2	$ 4.4M
WPN SYS PROC				4.6	TBD	TBD
QUANTITY BUY				1	224	225
DELIVERIES					225	225

We have not closed the doors on any of that at this time. We have $4.4 million R. & D. to do little things for the airplane. We will buy the first airplane in 1984. With this $600,000 we can prepare the RFP and run the source selection and be ready to buy them off the shelf. As you may imagine, there are a lot of contractors who are selling this type airplane who are interested in this thing. There should be spirited competition and the Air Force should get a good buy on that.

Combat identification—sometimes not a very glamorous category but certainly a very necessary thing. It is a triservice effort to improve our identification capability. I thought these pictures (pictures deleted) were worth showing in that the MIG–25 in some angles looks very similar to the F–15. We not only have to be able to identify aircraft electronically, sometimes it is difficult to identify them by the eyeball.

Senator GOLDWATER. That used to be the most difficult course to teach. The cadets would all go to sleep.

General RUSS. We have several different types of things ongoing in this area, divided into cooperative system and noncooperative. In the noncooperative we are really talking about such things as the [deleted].

In the cooperative area it is a method by which you primarily know who your friends are because you can read their IFF.

As you know, [deleted]. We have tried for some time for a NATO IFF standardization agreement. We hope to have that done this year.

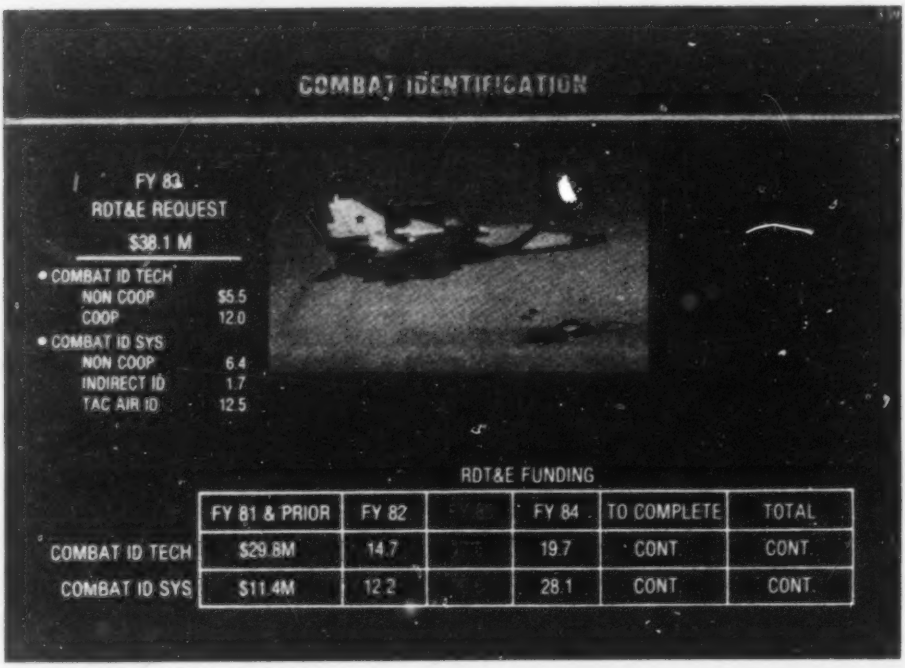
Part of the problem in this area is what type and what band will your IFF be in. This is what we call a Mark 15, which is the new IFF which will follow the current one we have on all the airplanes.

The Air Force, supported somewhat by the French, think that we ought to have an [deleted]. The Germans and the United Kingdom believe we ought to have [deleted]. You can use either one.

Our view is based somewhat on the fact that all of the FAA systems use [deleted] and it would be very costly for us to change that. We would still have to have some [deleted] capability. The British and the Germans, on the other hand, [deleted] and that is true, you do. We may end up with some sort of compromise. I am not sure where that is going, but hopefully we will have that sorted out this summer.

Senator GOLDWATER. Don't the Soviet [deleted].

General RUSS. [Deleted.]

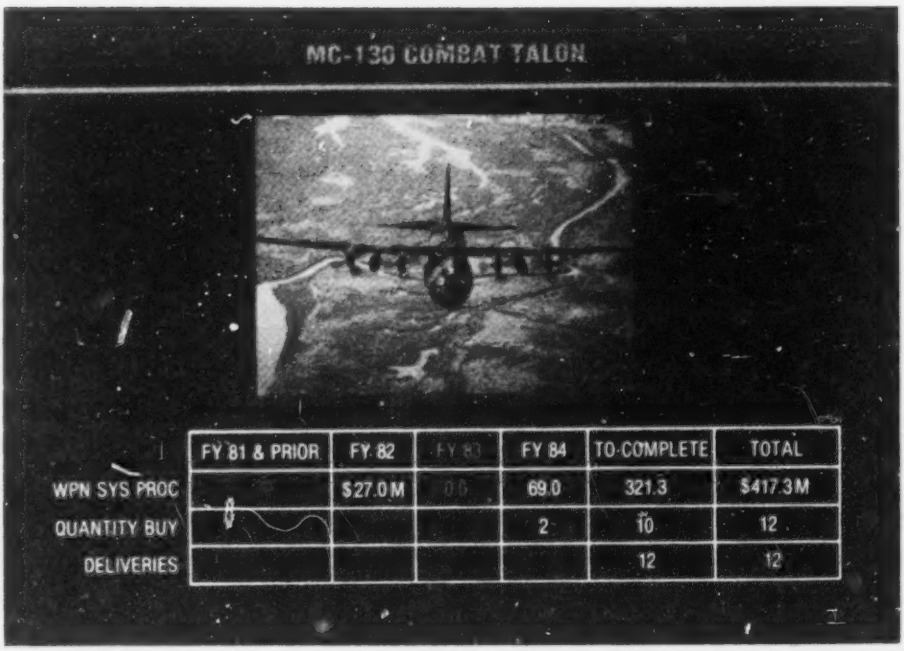


Our major effort in 1983 is broken down as shown into research and development. In noncooperative, we have $5.5 million. This is a special access program, sir, that we can discuss at some other time. I am sure you would be interested in it. That is in this line. If I am not mistaken, sir, that is the last one I have.

Senator GOLDWATER. What is the Air Force doing in the remotely piloted vehicle area?

General RUSS. I think that would probably be better discussed in a separate session. I don't think I can discuss that in this forum, but I will be happy to come over at some later time and sit down and discuss it with you.

Senator GOLDWATER. Last year Congress added advance procurement for the MC-130H aircraft. Did the Air Force request funds in fiscal year 1983 for the procurement of MC-130H's?



General Russ. No, sir, we did not. We currently have 14 MC-130's in the inventory and we need 12 more. This $27 million is what was put in for long lead last year. In fact, the Congress put that in. It was our intent at that time to procure MC-130's in 1983. As we finally put the budget to bed and in the last throes of the budget we ended up not having any money in that line primarily because of higher priorities.

We rephased that program since it was convenient to do in one respect and we have higher priorities in the other. We would plan on using that $27 million as long lead and buy the first two in 1984. I think we buy four in 1985 and six in 1986, for a total of 12 aircraft to fully flesh out the fleet.

Senator Goldwater. Would the Air Force want to transfer funds from the F-15 procurement into this program?

General Russ. No, sir, not at all.

Senator Goldwater. In other words, you can live without this airplane right now?

General Russ. Our priorities would be that we would not buy it in 1983, yes, sir. We would like to have some more of those MC-130's, but we believe th t we can buy them in 1984.

Senator Goldwater. We have a feeling that the House wants to buy some of these.

General Russ. Yes.

Senator Goldwater. They probably will want to take the money out of the fighters.

General Russ. It is not a matter of whether we want it or don't want it, as you well know; it is a matter that this 130 line is ongoing; they are producing some for foreign military reasons. It is not a big cost perturbation to buy two this year and two next year; it is one of those things that is not difficult to do and will not impact the price significantly.

If you start getting into the F-15 and run their production line up and down, you know where we have been before; you really

start paying for it, so we have looked in our budget at all trades. It was our best judgment this was the wise thing to do.

If we had $69 million more we would have bought them in 1983, but when we got to the end we didn't have it.

Senator GOLDWATER. The Air Force has proposed a Seek-Talk system to link their secure-voice requirement for the late 1980's. What is the projected total program cost of the Seek-Talk system?

General RUSS. Sir, I don't have that figure, but I will be glad to provide it for you.

TOTAL PROGRAM COSTS FOR SEEK TALK

The estimated cost of developing, procuring and installing 7,500 seek talk units in approximately $3.6 billion then year dollars. This cost includes all development, test, integration engineering, procurement, installation, labor, spares, support equipment and test equipment. This procurement program would begin in 1983 and stretch through 1993.

Senator GOLDWATER. I have some questions here relating to that. I will just give them to you and ask that you supply the answers for the record.

General RUSS. All right, sir.

Senator GOLDWATER. Do any staff members have any questions? Thank you, General, it was a very fine presentation.

General RUSS. Thank you, sir.

Sir, General Bowden is now going to cover the "other procurement" area. I will turn the stage over to him.

Senator GOLDWATER. General Bowden?

STATEMENT OF BRIG. GEN. WILLIAM P. BOWDEN, USAF, DEPUTY DIRECTOR, LOGISTICS PLANS AND PROGRAMS, ODCS L. & E., DEPARTMENT OF THE AIR FORCE

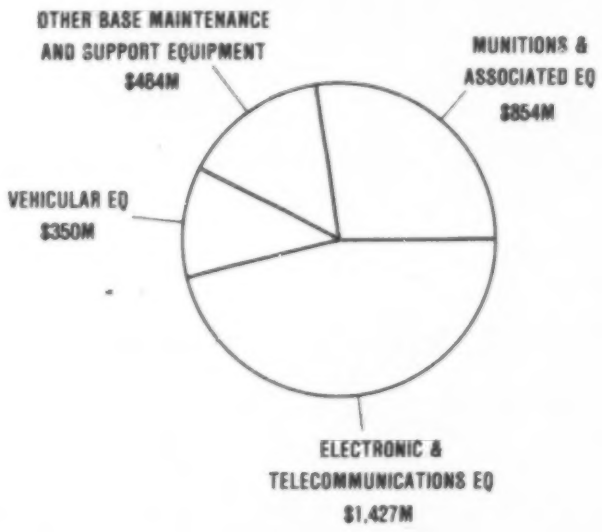
OTHER PROCUREMENT

General BOWDEN. Sir, I would like to submit a statement for the record. I have short a presentation here that describes the Air Force's "other procurement" programs.

FY 83 OTHER PROCUREMENT APPROPRIATION

(WITHOUT SPECIAL PROJECTS)

$3,095 MILLION



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General BOWDEN. For your information, there are four accounts in our other procurement area.

There are the munitions, many of the munitions that General Russ talked about. They are in our procurement program as we are moving to modernize a lot of our air-to-ground munitions and air-to-air munitions.

The three other accounts in this other procurement, I will discuss pieces of them with you this morning.

There are the vehicles. There are the telecommunications and electronics, both the strategic and the tactical. I will simply cover some of the tactical telecommunications.

Then we have another category called other base maintenance and support equipment, and I will show three of four of those examples.

We are talking of things like arresting barriers; night-vision goggles, both for security police, helicopter crews, and gunship crews, for various air-to-ground operations, so it contains a wide variety of subjects.

I will walk you through some of the types, sir.

This gives you the scope of our program and the total other procurement. About $3 billion is in the request for fiscal year 1983.

In addition, there are some special activities or intelligence programs that add about $2 billion more, so this is around a $5 billion program in the other procurement category.

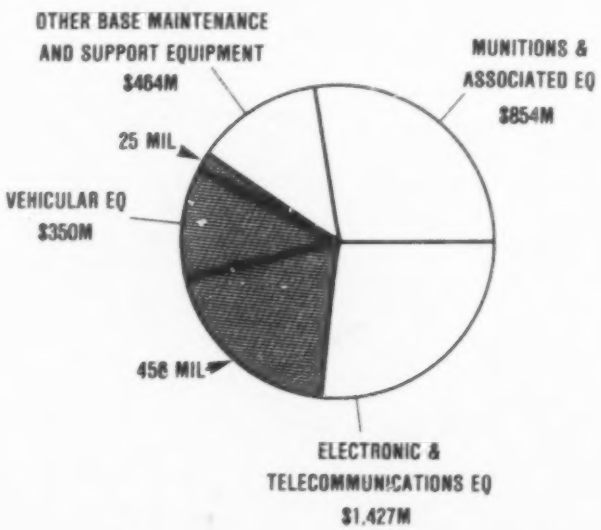
You can see that the munitions for 1983—this covers both our WRM munitions as well as the training munitions, and for your information I think we have done a good job in laying in the training munitions to try to increase our readiness of our pilots.

In the other base maintenance and support equipment there is about $460 million. There is a wide variety of equipment in this. We are talking about base-lab-type equipment and calibration-type equipment. Many things are in this category.

In the vehicular equipment, this has been a long-neglected account. We have not been putting much money into vehicles over the years. We have started a good effort and we are turning that program around and we have good support within the Air Force, and I think over the next 5 years we are going to get to the point where we can get back to the business of modernizing the vehicles when it is time to modernize.

The electronics and telecommunications totals about $1.4 billion. It contains everything from radios through the big radars, DEW Line types of equipment.

FY 83 OTHER PROCUREMENT APPROPRIATION TACTICAL
(WITHOUT SPECIAL PROJECTS)
$3,095 MILLION



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Specifically, we narrow down to the things in the shaded area here, three of the four programs we are going to talk about for a few minutes.

The other base maintenance and support equipment, about $25 million is in the tactical area. In the vehicle area we talk about the entire scope of that program. Then in the electronics and telecommunications, about $460 million.

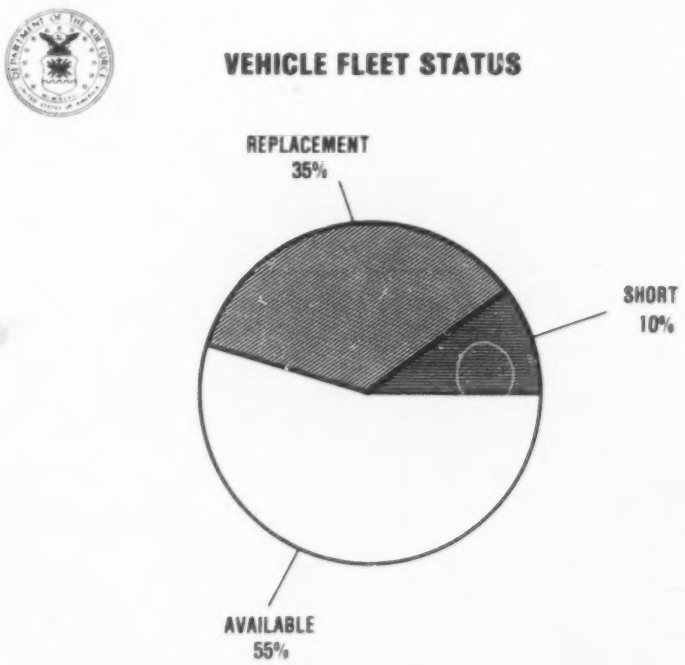
First, the vehicles. I show you this graph [graph deleted] to give you some information that we think is key to our philosophy about how we go about the procurement aspects.

On the right side we are trying to get across the point that for 90 percent of our vehicles we go to the commercial market. We don't ask for specialized equipment. We try to use the existing technol-

ogy and adapt and put things together to meet our mission requirements.

On the left, most clearly there are some operations where we need to have some military specification vehicles. About 10 percent of our requirements have these military specifications. Whenever we are operating forward air controllers with the Army, it makes sense to get the kind of vehicles that the Army has, so that we can get the right kind of parts, maintenance, and the good interoperability aspects.

The specifications for military design are a very small piece of the action.



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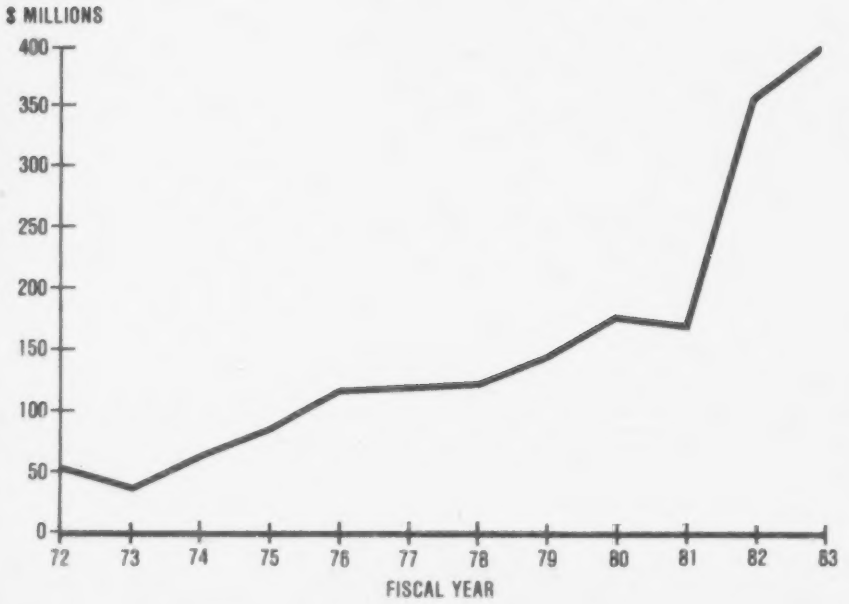
As I mentioned and you well know from your experience, sir, the vehicles that we have in the U.S. Air Force are old. We have DOD criteria that states we ought to be replacing vehicles at the 6-year point, other vehicles at the 8-year point, other vehicles at the 10-year point. I was looking at some data as we were getting prepared to come over here. I noticed on the average we go 2 or 3 years beyond established criteria, making our people do with what they have. You can see from the pie chart there that almost 3 or 4 vehicles out of every 10 are in that older category, and they really need to be replaced.

BUDGET HISTORY



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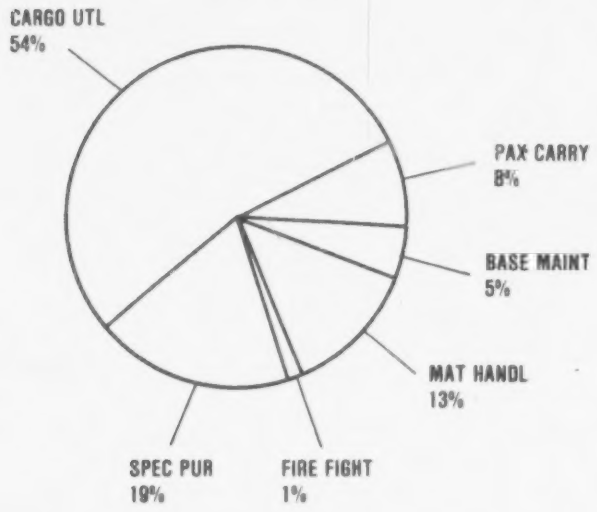
This is what I alluded to about program neglect and how we wound up in the Air Force with our aging vehicles. This essentially deals with $50 to $60 million that we put in the budget during the 1970's. We started making some progress as we moved into the 1980's, tying our vehicles right with our mission readiness and going in the same kind of categories and priorities as we do with our aircraft spares, engine parts and missile parts—a very key element.

So, we have been getting very good support for our vehicle accounts as we are working the problem within the Air Staff.

FLEET COMPOSITION-QUANTITIES BY CATEGORY



53

Just a few numbers that I think are very significant:

We take a lot of flak about our sedans that we have and the numbers of them, the visibility of them, but, sir, it is a small piece of the Air Force dollars. This passenger carrying situation, 8 percent, includes not only the sedans but also includes ambulances, buses and so forth. Really, there is only 1 or 2 percent of Air Force dollars spent on sedans. The rest of it is mission equipment such as pickups, vans and flight-line-type equipment. This shows our tugs, and refueling trucks (referring to bottom of chart), firefighting equipment, forklifts, K-loaders, bulldozers and earth-moving equipment. This is how the buy breaks out. We are really making strides in what I call mission equipment modernization.

Here are some things that are high-dollar items [chart deleted]—the refueling trucks. As a matter of fact, our flight-line vehicle account in this kind of equipment, 10 percent of our budget this year, goes to this kind of equipment modernization.

Senator GOLDWATER. What is the cost of one of those trucks?

General BOWDEN. This is in the $100,000 category, sir. You are talking about big business when we buy new forklifts, K-loaders water trucks, refueling trucks, and firetrucks. That is a ballpark figure that you need to keep in the back of your mind. But we are competitive, sir.

General Russ mentioned how we buy a lot of our munitions and equipment. We transfer money to the Army and get on their contracts. With the kinds of commercial design we are talking about, we do in fact have good competitive opportunities. We have opportunities to do some multiyear-type contracting. So, the opportunities are there for us to try to accomplish a good job in the procurement arena.

In the towtruck area we made some good strides in buying these kinds of vehicles, tactical fighter towtrucks. The same way with re-

placing the older farm type tractors that pull the munitions trailers, our power carts and so forth, in support of the flight line. So, we are coming up with some good vehicles that get the job done. We can move them around to support various exercises and war-making plans we are required to support.

FIRETRUCKS

Here is some very important equipment that we are putting money in, that is, C–5, C–141, and C–130–type loading equipment that you see at our air terminals. The 40K loader works with big airplanes, the other loaders, all of them are compatible with our airlift forces.

We are buying standard forklifts. As I recall, about 90 of these adverse terrain special forklifts work in conjuction with on bare-base operations a very important piece of our ground support.

Here are the cargo utility vehicles along with the flight-line vehicles. A number of these trucks are used in a wide variety of maintenance activities, used to support maintenance at Minuteman sites and transporting flight crews. I have ridden in these trucks in my whole Air Force career. These trucks are a very important aspect of our flight-line maintenance and civil engineering work.

FLIGHTLINE MAINTENANCE TRUCKS

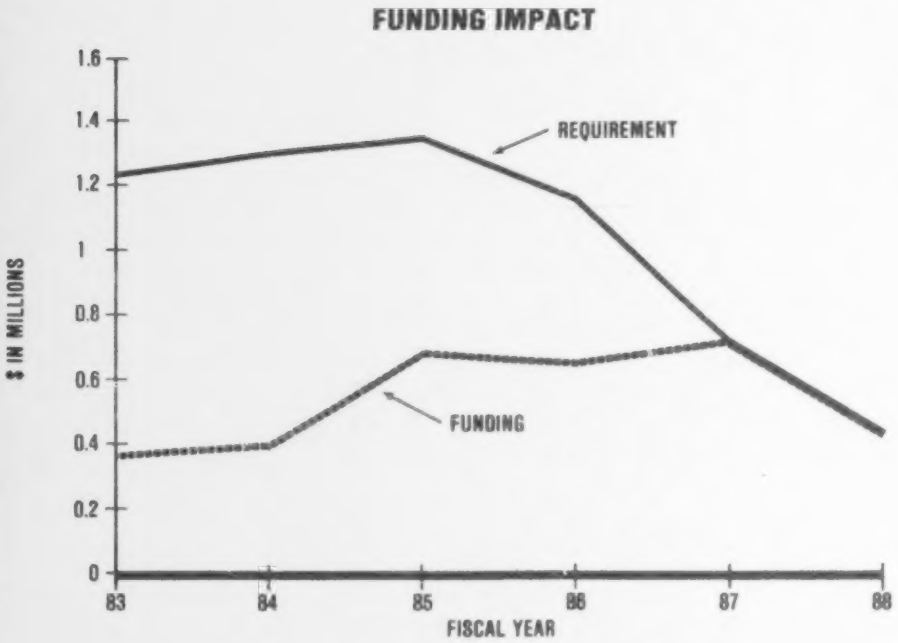
Earth-moving equipment. Here it is supporting rapid runway repair. We are making special efforts to try to put in some good logistic support for rapid runway repair to repair bomb craters. Here you can see where he is trying to use standard equipment, graders and earth-movers, bulldozers, to get the job done, so that we can fill up the hole and put the AM–2 matting down and get the airplanes back in business again.

AMBULANCES

We are changing the style of Air Force ambulances. We are going to the modular-van type.

Numbers that might be useful to you. When we buy programs like this, we buy 350 of them a year. That is the kind of numbers that we are talking about. I believe the major commands do a good job in the way they are assessing the kinds of balance of vehicles, which styles to buy, which models to buy, to meet their requirements. So, they get a pretty good scrub.

I think we have a good requirement determination process. Over the years we simply have not funded the requirements.



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These are the dollar requirements. The other chart left off here at about the $350 million mark a year. You can see the kind of profile that we are putting against this total requirement. So, we are slowly chipping away each year in our plan and budget process. When we get out here to 1987 the lines will match again and we expect in 1988 to have a program where we need to modernize.

OTHER BASE MAINTENANCE AND SUPPORT EQUIPMENT (TACTICAL)

	($ MILLIONS)
NIGHT VISION GOGGLES	2.7
ARRESTING BARRIERS	2.3
TACTICAL SHELTERS	15.3
RRR KITS	.4

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I will switch gears now and talk to some of the other equipment. I will talk about some night-vision goggle requirements, arresting barriers on runways, some shelters that we use in our mobility programs for maintenance, supporting the Air Force communications-type maintenance, supporting F-16 back shop maintenance.

Then there are some dollars that we are putting on rapid runway repair kits. These include tools that go with those earth-moving-type equipments that I showed you before. These are pneumatic drills, cutting torches, and some temporary lighting devices to help put up a string of lights after we complete runway repairs.

Let me get to the night-vision goggles. These goggles that you see here have been with us since about 1970; they have two applications. The security police can use them at night and, of course, the helicopter crews and search-and-rescue crews, as well as C-130 gunship crews. It takes moonlight, [deleted] in order for these night-vision goggles to work. They do a pretty good job. They are the PVS/5. We are buying about 75 of these for special purposes.

We do want to come up with an improved one that is better suited for airborne-type operations. This version is coming along and we are requesting dollars for 150 of these in the fiscal year 1983 budget. They simply clip onto the helmet. He flips them down just like a left-fielder does when he goes after a flyball.

This one has an improved lighting sensing device; you can use [deleted] as opposed to requiring a [deleted] as in the other ones. We are making some progress in our night-vision goggle support program.

Arresting barriers are another program that we put attention on.

This is the BAK-12 variety. We are moving to another variety for special application called the BAK-14, where we put the same cable in the trench, put a door over it and it is ideally suited for a joint operation at civilian airports, where we also operate tail hook equipped fighters.

I noted earlier, we were talking about F-16 centerline stores such as 30mm pods. We really need the BAK-14, because we are getting cable whipping action on centerline stores when we use the BAK-12. So it is important that we pay attention to that procurement program.

Now the maintenance shelters. This maintenance shelter is a small one that fits our mobility requirements. They repair communications and radio equipment in it. You can take them to a site and put them together, open the doors and fill in the space and essentially you get three shelters for the price of two to repair communications and electronics equipment.

This is another shelter, a little bit larger. This one is about 20 feet long and eight feet wide and eight feet tall. It is very important in our F-16 mobility program. We are using it for intermediate test stations when we go with an F-16 deployment. It takes a dozen of these shelters to completely house the electronic black-box maintenance repair for an F-16 squadron.

TACTICAL COMMUNICATIONS
FISCAL YEAR 1983

$ 456 MILLION

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I have a few charts on the other area of tactical communications. The three pieces of this $450 million program, tactical mission equipment, command and control, and then in this area we have equipment that supports our 18 training ranges around the world, the simulators and so forth, that are at Nellis Air Force Base.

First, I'll show you a picture of the tactical mission equipment. Here is the radio and communications gear that is on a pallet and mounted on a jeep. This is used by the forward air controller. Of course, the equipment can go on a number of other type vehicles also—armored personnel carriers and so forth.

This is in the command and control area. This is the troposcatter radio equipment; it is mobile; it ties the field operation command and control system with those in the main operating base command post system. Of course, this is typical of the way we need to go with our tactical mission equipment as we modernize. It has been long neglected also and we need to go with state-of-the-art modular electronics. We need to have good processing equipment. We need to put in some antijam-type equipment to go with it. This is characteristic of the kinds of things that we ought to be doing with our command-and-control tactical equipment.

All of the mission equipment is in the vehicle. These antennas simply fold up like an accordian. You can put them in a trailer. You put both of the antennas in the trailer, and you can be adaptable to the changing mission area.

This is the other category, the simulation-type equipment, that supports the training and test ranges. This is equipment that simulates enemy guns, SAM equipment. We have a wide variety of these kinds of simulators that we run the EF-111 against and our other tactical fighters.

There are many other pieces of this training equipment that are important such as the air combat maneuvering instrumentation system to be able to measure air-to-air training.

We also have some good video-type equipment so that we can capture the simulations and then play back critiques so that our air crews can get the right kind of feedback in their simulation and training exercises.

That runs through the three categories of equipments, sir.

I will be glad to entertain any questions you might have.

[The prepared statement of General Bowden follows:]

PREPARED STATEMENT OF BRIG. GEN. WILLIAM P. BOWDEN, DEPUTY DIRECTOR, LOGISTICS PLANS AND PROGRAMS, DEPUTY CHIEF OF STAFF/LOGISTICS AND ENGINEERING, HEADQUARTERS, U.S. AIR FORCE

Mr. Chairman and Members of the Committee, I welcome the opportunity to discuss with you the Air Force, Other Procurement Appropriation and in particular the fiscal year 1983 budget request. The Other Procurement Appropriation consists of four separate budget programs: munitions and associated equipment, vehicular equipment, electronics and telecommunications equipment, and other base maintenance and support equipment. Excluding the Selected Activities and Special Update programs, the funds requested in fiscal year 1983 for Other Procurement are $3.1 billion.

Today, my specific purpose is to describe the tactical portion of the Other Procurement request. The tactical elements in the fiscal year 1983 program are composed of the total Vehicular Equipment Program, tactical related programs in the Other Base Maintenance and Support Equipment budget activity and the tactical portion of the Electronics and Telecommunications program. Collectively, the tactical elements total $831 million or 27 percent of the Other Procurement appropriation. The vehicular equipment program provides for the time-phased qualitative and quantitive fleet improvements and procures support vehicles for new weapon system acquisition programs. The Other Base and Support Equipment program contains tactical related projects for personal protection, rescue, mobility and aircraft recovery. The Telecommunications program supports acquisitions and upgrades in tactical command, control, and communication.

I would like to begin with a discussion of the Vehicular equipment program and follow with a synopsis of the tactical other base and support equipment and tactical telecommunications programs.

VEHICULAR EQUIPMENT

The Vehicular Equipment budget activity provides for procurement of vehicles for flight line operations, base maintenance and construction, materials handling, and cargo and passenger transportation. Each vehicle is basic to sustaining the Air Force mission in peacetime and during wartime contingency operations. Continuing emphasis placed on vehicular equipment in the fiscal year 1983 budget recognizes the need for quantitative fleet improvements. Fiscal year 1983 vehicle requirements exceed $1.2 billion. This budget request is vital to a phased and prudent fleet enhancement program which emphasizes direct mission support and readiness. Proposed funding levels counter the present unreliable fleet posture where 45 percent of current vehicle authorizations is either unfilled or filled with assets which exceed replacement criteria.

The Air Force is presently authorized 116,000 motor vehicles. Acknowledging the past funding shortfalls in the vehicular equipment program, the fiscal year 1983 budget request continues a sustained improvement effort to resolve Air Force vehicle deficiencies over the five year defense plan. Inadequate funding adversely affects vehicle availability to technicians and other users across the Air Force. Vehicle availability and condition are a significant determinant of mission capability.

For budget purposes, the Air Force vehicle fleet is divided into six categories. These categories are: Special purpose vehicles, Fire Fighting equipment, materials handling equipment, cargo utility vehicles, passenger carrying vehicles and base maintenance support. In the special purpose category we are requesting $86.3 million. Of this amount, $34 million are required to exercise the third year of a three-year multiyear contract for the R-9 aircraft refueling truck. The R-9 is the largest dollar item in the fiscal year 1983 vehicle budget request. Aircraft and flightline tow tractors are also included in this category. All special purpose vehicles are critical to our ability to generate aircraft sorties.

Funds in the amount of $5.1 million are requested for procurement of fire fighting equipment. Funds will buy quick response rescue and structural fire trucks and fire extinguishers which are all vital to Air Force resource protection.

Adequate and reliable materials handling equipment (MHE) is one of our most critical requirements as rapid onload and offload of strategic and tactical airlifted war material is imperative. The fiscal year 1983 budget request contains $45.4 million for MHE. Mobilization exercises have confirmed shortfalls in our MHE capability and highlight the need for additional MHE to support the massive airlift of forces within the first crucial days of a military force projection. In addition to aircraft loaders and forklifts, the materials handling equipment category includes forklifts and tractors for use in warehousing and marshalling operations.

Funds in the amount of $123.9 million are included in the fiscal year 1983 budget request for Cargo Utility Vehicles. The cargo utility category consists of pickup trucks, dump trucks, truck tractors, wreckers, several types of trailers. These vehicles are the backbone of the fleet, critical to our transportation and distribution systems. Some vehicles in this category are military (M-Series) heavy duty, off-the-road design. These vehicles enhance our warfighting capability by equipping tactical communications and other mobile units with vehicles compatible with and supportable by the Army in forward combat locations.

The passenger carrying vehicle category contains $28.7 million for various size buses, ambulances, and sedans and station wagons. Buses are essential in providing crew transportation and other group transportation. Ambulances provide a key element in medical services, and light passenger carrying vehicles are used for taxi services, airdrome operations, and base fire marshall transportation.

The final category is the base maintenance support. This category includes $60.9 million for rapid runway repair (RRR) vehicles, Red Horse construction equipment, aircraft runway and street sweepers, cranes, excavators and front end loaders. These roads and grounds maintenance vehicles are necessary to the daily operation of every Air Force installation. Runway sweepers reduce foreign object damage (FOD) to aircraft engines, front end loaders are necessary for road and runway repair and snow removal. Excavators are essential for earthmoving projects.

This concludes my discussion of the Vehicular Equipment program. I would like to now address the Tactical portion of the Other Base Maintenance and Support Equipment activity.

OTHER BASE MAINTENANCE AND SUPPORT EQUIPMENT

The fiscal year 1983 budget request contains $25 million for Tactical related projects in the other base maintenance and support equipment budget program. Specific items are: night vision goggles, aircraft arresting systems, rapid runway repair kits, and tactical shelters. Night vision goggles enable personnel to see in night/low visibility conditions. The goggles are used principally by special operations forces and air rescue and recovery aircrew personnel.

Aircraft arresting systems are required to recover battle-damaged or malfunctioning tactical fighter aircraft. Arresting systems can be used when weather conditions make routine landings unsafe. The rapid runway repair kits when used with related vehicles procured in the vehicular equipment program provide the capability to rapidly repair runway and taxiway damage following an enemy attack. Two types of tactical shelters are planned for procurement in fiscal year 1983. The S-530 shelter is used as a clean environment for the repair of tactical communications equipment in the deployed environment. The NAVAIR shelter is used to house the avionics interim intermediate support equipment for tactical fighter aircraft units with mobility commitments.

I would like to turn now to the Tactical Communications area where the fiscal year 1983 budget request contains $456 million for Tactical oriented projects.

TACTICAL COMMUNICATIONS

The Air Force fiscal year 1983 Tactical Communications Procurement Program will provide modern, interoperable, jam resistant, and securable communications, command, and control (c^3) equipment for our tactical forces. These programmed improvements enhance tactical air control operations and provide C^3 flexibility. The Tactical Air Control System (TACS) must possess unique characteristics to meet wartime scenarios. Forces must be able to deploy to any part of the world and be able to sustain operations with limited weaponry, communications, and logistics support.

For purposes or presentation, the program is categorized into three areas: Tactical Air Control, Tactical Command and Control, and Logistics Support/Training. Please note that equipment procured with the Other Procurement Appropriation is for ground application only. I will begin now with a brief description of the Tactical Air Control mission.

Tactical Air Forces must be able to counter enemy aircraft, interdict enemy lines of communications, provide close air support for friendly forces, provide tactical airlift, suppress enemy defensive systems, and obtain reconnaissance information vital to the planning and conduct of successful military operations. The TACS supports all phases of the Tactical Air Control mission.

TACTICAL AIR CONTROL

Our fiscal year 1983 budget request contains $123 million to buy communications equipment that performs the tactical air control mission. A discussion of these programs follows:

Seek Talk.—The Seek Talk program will provide Tactical Air Forces the capability to conduct air-to-air and ground-to-air-to-ground Ultra High Frequency (UHF) voice communications in hostile jamming environments. Seek Talk employs adaptive antenna array techniques to "null" a number of enemy jammers at once. Pilots will be able to conference with each other and airspace controllers in real-time even in the most intense jamming environments.

Pacer Speak.—Forward Air Controllers assigned to Army units require mobile communications systems that are rugged, securable, and interoperable with Army and Air Force communications systems. Pacer Speak is a replacement program of existing tactical air control parties communications equipment that is obsolete, nonsecurable, and not able to keep up with Army mechanized combat units. Pacer Speak will provide modular, solid state, anti-jam radio communications that can be mounted and operated from jeeps, or if necessary on the backs of forward air controllers.

Tactical airlift equipment.—Fiscal year 1983 funds will control the procurement of communications equipment to be used by combat control airlift teams when deployed to austere, forward airfields. Funds are also requested to procure consolidated aerial port automatic data processing equipment and a secure capability to transmit and receive force control information.

Ground launched cruise missile (GLCM) communications.—GLCM communications equipment to be procured with fiscal year 1983 funds include tactical radios for convoy operations, personnel and vehicle intrusion detection equipment, and base communications systems, e.g., weather observation, teletype, base cable plant equipment.

C^3 countermeasures (C^3CM).—The Air Force must be capable of disrupting enemy communications, command and control systems and sophisticated electronics-dependent weaponary by electromagnetic means (jamming, deception, or exploitation) or force. Furthermore, the Air Force must be able to prepare tactical and strategic aircrews for an intense enemy C^3CM environment. Fiscal year 1983 funds will provide offensive C^3CM to satisfy operational and training requirements.

Tactical reconnaissance.—Air Force reconnaissance aircraft and associated ground processing equipment provide commanders with the essential information necessary to plan and conduct military operations. The associated ground intercept facilities and imagery processing, dissemination, and interpretation facilities are capable of interfacing with these infrared, photographic, and radar sensor reconnaissance systems. Fiscal year 1983 funds will provide the fourth and final Transportable Ground intercept Facility, tactical signal intelligence support equipment which will provide improved communications systems between collection systems and the elements of the TACS.

Combat supply system (CSS).—Fiscal year 1983 funds provide the production funds to complete the acquisition of CSS hardware. CSS equipment consists of small transportable minicomputers which are programmed to operate the minimum essential

supply processes required to support combat forces deployed to austere forward locations.

TACTICAL COMMAND AND CONTROL COMMUNICATIONS

The information and data obtained by operational tactical systems must be made available to theater commanders, and mission planners in real-time. The TACS must possess a versatile command and control system that can be deployed worldwide and that can operate in tactical, bare base environments. The Air Force fiscal year 1983 tactical command and control communications budget request is for $233 million. A discussion of significant procurement programs follows:

Joint tactical communications program (Tri-Tac). TRI-TAC is a joint service effort to develop and acquire tactical communications equipment that can be commonly used in combat. TRI-TAC equipment will replace existing logistically hard to support and maintain systems with modern, interoperable, digital equipment that will allow total system security and increased capacity to support both data and voice point-to-point switching and transmission needs. The Air Force fiscal year 1983 budget request will provide second year production funds for the AN/TRC-170 tropospheric scatter radio multiyear contract; the first year production funds on the AN/TSQ-111 communications nodal control element (CNCE); and switching facsimile, and circuit synchronization equipment.

Communications security equipment (COMSEC).—The Air Force must be able to protect both voice and data communications in order to deny the enemy intelligence with which counter operations could be conducted. Encryption, decryption, and associated timing systems are essential to the successful conduct of Air Force operations. The fiscal year 1983 budget request will provide ground application COMSEC equipment for tactical systems.

Ground mobile force satellite terminals (GMFT). Long-haul tactical communications are essential to the worldwide command and control of the tactical air force. The Air Force utilizes modern ground satellite systems to access the worldwide satellite communications network. The Army, the DOD executive agent for ground satellite terminals, will procure the fiscal year 1983 GMFT systems for the tactical air forces and small satellite terminals for use in Europe for NATO-committed Air Force units.

LOGISTICS AND TRAINING

The logistics support portion of the Air Force Tactical Communications Procurements Program is the final area to discuss. Funds in the amount of $100 million will provide modifications and combat aircrew training equipment. A brief discussion of these programs follows:

Modification programs.—In many instances the Air Force chooses to modify existing systems rather than procure new equipment. Safety deficiencies, operational reliability and maintainability problems, logistics support difficulties, and new or expanded operational capabilities are satisfied with modification procurement dollars. In fiscal year 1983, funds will enable accomplishment of 47 modification programs.

Combat aircrew training equipment.—The Air Force operates numerous ranges worldwide that provide realistic combat training for tactical and strategic aircrews. The ranges must simulate enemy jamming systems and threat emitters, e.g., anti-aircraft-artillery (AAA), surface-to-air missile (SAM), and radar acquisition systems. Also, ranges must be capable of assessing aircraft performance in both air-to-air combat and aircraft maneuverability through "enemy" defenses. Fiscal year 1983 funds will provide range improvements and new threat simulator equipment.

This concludes my discussion of Air Force Tactical programs of the Other Procurement Appropriation.

Senator GOLDWATER. A member of the staff has a question.

Mr. DOTSON. General Russ, the Air Force requests advance procurement for the F-15 for 1985, 2 fiscal years away. This appears to be a somewhat unusual request, since the F-15 is not a multiyear procurement program.

Have you used 2 year advance procurement before, and if so, what would the past dollar amount for the 2 years have been?

General RUSS. In answer to the first question, have we used it before, the answer is yes, we have. I would have to research the exact amount of money. We used it on the F-16 in 1981.

As you know, the lead times for some of the strategic materials have increased significantly, although I will say that they have leveled off now. This has necessitated our providing long lead funds for such things as titanium and forgings and actuators. These sorts of things are the ones that are involved in the F-15 program that require the long lead.

What has transpired in the past is to some extent the contractors have picked up the burden on that because it was maybe just over a 1-year lead time, but as the costs increased and the lead times extend, the Air Force believes that it is only prudent that we budget for that. We started that in 1981 with the F-16.

Mr. DOTSON. To your knowledge, are the other services using 2-year advance procurement for aircraft this year?

General RUSS. I saw a list the other day of all the 2-year procurements. I don't know if I brought it with me or not. I don't think I did. Let me say that it had Army and Navy programs on it. I don't know what they are. I really was not that interested in it, but they were all on the same sheet.

My best judgment is yes, they have them. I can look and see what they are, if you would like, and let you know.

[The information follows:]

TWO YEAR ADVANCED PROCUREMENT FOR A/C

Yes, the Army and Navy both have programs requiring two year advance procurement. These programs are listed below showing the fiscal year in which two year advance procurement funds were first requested.

System and fiscal year	*First time requested*
Army:	
MLRS	1983
Blackhawk	1982
CH-47	1983
ALQ-136	1982
Navy:	
C-2	1982
A-6	1983
EA-6	1983
CH-53	1983

One year advance procurement combined with production lead time for the F-15 is 33 months. The current lead time required for production and acquisition of certain components for the F-15 is in excess of 39 months. For instance, components such as titanium forgings, landing gear and actuators are currently critical long lead requirements.

Without adequate two year advance procurement, a 6 month production gap could potentially result should the prime contractors not protect production long lead requirements with their own capital. F-15 production delays and increased aircraft costs would then be experienced.

Mr. DOTSON. There have been recent articles in Aviation Week showing increased leadtimes for materials, forgings and castings. Does this in any way impact your request for 2 year advance procurement of the F-15? This started out as a budget process early last year?

General RUSS. Yes, it does. Like I said, the lead times are such that especially in titanium, especially in the forgings, especially in the actuators, the lead times are such that it is more than 1 year and it is more like 1½ years to 1¾ years. Therefore, you require,

up front money 2 years ahead of time or else somebody has to go out on contract or someone has to go out and put the money up to guarantee that material will be available.

In essence, that is exactly what you do when you go to multiyear procurement; you give the contractor the initial money up front and it allows him to buy 2 and 3 years' worth of material and it saves you money.

While it is not a multiyear procurement per se, it is a cost that is incurred and should be paid.

Senator GOLDWATER. General Bowden, we all know that vehicles on our air bases run anywhere from new to ancient. Are you trying to develop a new plan of procurement that would allow the bases to keep more modern equipment available? I am thinking of maybe leasing, like most of the police forces and highway patrols do today, leasing equipment until it gets a certain number of miles, then you get another piece. Have you looked at that kind of idea?

General BOWDEN. Sir, we have discussed the leasing aspect for some of the vehicles that we use. Quite frankly, we believe that the small quantities of those types are probably not worth it. The biggest part of our vehicle account deals with specialized-mission-type equipment that we need; it ought to be mobile. I know there is probably a place for some of this leasing that goes in some contracting out initiatives where you might ask a contractor to run a motor-pool operation that might have some application.

I have noted the requirements for vehicles in support of rapid deployment force objectives. We have substantial vehicle mobility requirements. I just think that we need to be very smart before we go too far with contracting out or leasing on this mission-type equipment.

I have some very strong views that we just about have taken all the blood out of that turnip that we can. You have to be able to go to war and you have to have the mission equipment there, and you have to have the organic people who can help in the skills rotation programs. It is my opinion, sir, that we don't have a lot of maneuver room in this contracting out of vehicles.

General BOWDEN. Yes, sir. I would say that in the vehicle management approach of trying to modernize each base's need we are in close contact with them; we are hearing them out; we are trying to be responsive to major commands; and we are properly dividing out the requirements for dollars each year.

Senator GOLDWATER. Thank you, General Russ and General Bowden. We certainly appreciate the efforts you have put into this testimony. I wish you would convey to General Burke our hopes and prayers for a speedy recovery.

We want to thank you for the information you have given us. It will be very valuable to us when we go to conference with the House and come up with some equipment that we can improve our Air Force with.

General RUSS. Thank you, sir.

General BOWDEN. Thank you, sir.

NATIONAL GUARD ASSOCIATION OF THE UNITED STATES

PREPARED STATEMENT BY MAJ. GEN. FRANCIS S. GREENLIEF (RET.), EXECUTIVE VICE PRESIDENT OF THE NATIONAL GUARD ASSOCIATION OF THE UNITED STATES

GENERAL

Mr. Chairman, and members of the subcommittee, I am appreciative of the opportunity to present the views of the National Guard Association of the United States on the all-important subject of the equipment needs of the National Guard.

The Army consists of the Regular Army, the Army National Guard of the United States and the Army Reserve. The Air Force consists of the Regular Air Force, the Air National Guard of the United States and the Air Force Reserve.

The Army National Guard provides the following percentages of the Army's combat capability:

29 percent of the total Army personnel strength; 33 percent of the combat divisions; 73 percent of the separate brigades; 57 percent of the infantry battalions; 41 percent of the mechanized infantry battalions; 43 percent of the armored battalions; 57 percent of the armored cavalry regiments; 51 percent of the field artillery battalions; and 30 percent of the aviation units, and equally higher percentages of other combat organizations of the Army.

The Air National Guard provides the following percentages of aircraft by mission areas:

27 percent of the total Air Force; 42 percent of electronic warfare aircraft; 66 percent of air defense interceptors; 57 percent of tactical reconnaissance aircraft; 38 percent of tactical support aircraft; 30 percent of tactical airlift aircraft; 27 percent of tactical fighter aircraft; 17 percent of strategic tanker aircraft; and 15 percent of rescue and recovery aircraft.

Considering the high percentage of Army and Air Force combat capability which is provided by the National Guard, it is not possible to assess the readiness of the Army and Air Force without assessing the readiness of the National Guard. When the subject of readiness is discussed, the discussion normally centers on organizational clothing and equipment, spare parts, petroleum oil and lubricants (POL), ammunition, maintenance capability, training support and combat support. Generally speaking, a discussion of readiness is taken to mean consideration of those things needed by soldiers and airmen operating their equipment in training or combat. However, when one considers the antiquity of much of the National Guard's equipment and absolute voids of some items of equipment, any discussion of National Guard readiness must address the equipment problem.

With the adoption of the Total Force Policy in fiscal year 1971, major elements of the active Army and Air Force were inactivated and their roles and missions were passed to the National Guard and Reserves. Guard and Reserve leadership applauded the establishment of the Total Force Policy because we were promised combat standard equipment with which to carry out the new roles and missions.

As stated in Secretary of Defense Laird's memorandum of August 1970, the purpose of increased reliance on the Guard and Reserves was to reduce defense expenditures, and significant savings were achieved. However, in our view, what has occurred is a classic case of double dipping.

Having reduced defense expenditures by eliminating active duty force structure, a series of Administrations have sought to further decrease defense expenditures by failing to ask the Congress for authority and funds to fully equip Guard and Reserve units to perform the roles and missions assigned them in war plans.

The equipment required by a unit is the same whether the unit be an active duty unit or a Guard or Reserve unit. The equipment requirement is generated by the fact that a unit is required by war plans—not by the component which furnishes the unit.

ANNUAL REPORT ON NATIONAL GUARD AND RESERVE COMPONENT EQUIPMENT

In past years, the Department of Defense budget requests did not address equipment shortages in the Guard and Reserves. It was, therefore, left to organizations such as ours to point out the equipment deficiencies of the Guard and Reserves.

The language of the fiscal year 1982 DoD Authorization Bill which requires of DoD an Annual Report on National Guard and Reserve Component Equipment was one of the most important legislative acts pertaining to the Guard and Reserve for many years. Although we have not read that report, I am quite confident that it shows no new procurement of equipment for the Guard and Reserve in fiscal year 1983. Based on procurement that has been requested for the Army and the Air

Force, the out years of that report must show some gains for the Guard and Reserves, but I am not competent to comment.

ARNG

Based on our knowledge of the total of equipment authorized for the ARNG and the deployable assets on hand, we estimate the major items equipment shortage of the ARNG at $3.7 billion. The following table displays our calculation of shortages and costs in 1981 dollars:

Item	Number short	Cost (millions)
Aircraft	933	$740
Tactical automatic data processing equipment	802	135
Tanks	694	657
Trucks	3,722	211
Artillery	310	102
Radars	433	29
Air defense:		
Chaparral/Vulcan	384	298
Stinger	9,600	50
Carriers	9,611	345
Communications		537
Other (engineer equipment, medical equipment, trailers, generators, shop sets, et cetera)		569
Total (in billions)		3.7

ARNG units have on hand only 78 percent of their training requirement for equipment and only 69 percent of their wartime requirement for equipment. Attached to my statement are fact sheets explaining the need for each item of equipment listed above. However, I do want to cite three items as demonstrations of the seriousness of the need.

ATTACK HELICOPTERS

Attack helicopter units of the ARNG are authorized 369 helicopters. Considering the 39 AH-1S attack helicopters that the Congress has added to procurement specifically for the ARNG and older AH-1S's being provided by the Army, the ARNG will have only 83 AH-1S's on hand at end fiscal year 1984. If the Army's planned procurement of AH-64's is built and delivered as planned and if all of the AH-1G models in the Army inventory are converted to AH-1S's, the ARNG will still be short 286 attack helicopters at the end of the AH-64 production. The ARNG attack helicopter units cannot fight in Europe with the UH-1 C, M, B models with which they are now equipped and will still be equipped in 1990. We urge this committee to authorize the procurement of 62 AH-1S attack helicopters for the ARNG in fiscal year 1983. If in fiscal year 1984, AH-64 procurement can be expanded to include the Guard's requirement, it should be expanded. If not, AH-1S production should be continued until the Guard's requirement is met.

TRUCKS AND TRAILERS

Force Activity Designator (FAD) III units are the ARNG's earliest deploying units; FAD IV and V units are later deploying units. These units are short 4,218 trucks of all types. These same units are short 10,198 trailers of all types. The shortage of trucks and trailers may not appear to be as critical as shortages of aircraft, tanks and other exotic weapons systems, but without trucks and trailers to move soldiers, ammunition, fuel, artillery, maintenance support and communications, units cannot fight or function.

AIR DEFENSE WEAPONS

The air defense battalions of the eight ARNG combat divisions are without usable weapons. The eight air defense battalions are equipped with Korean War vintage M-42 Dusters which were dropped from the active Army's inventory in the early 1960's. The light tank chassis on which the twin 40mm guns are mounted are almost impossible to maintain because of the lack of parts. The high explosive am-

munition is not safe to fire. In short, the eight ARNG combat divisions cannot protect themselves against air attack.

All active Army divisions are equipped with Vulcan/Chaparral air defense weapons. The Army is not satisfied with the Vulcan gun and has developed a new Division Air Defense System—DIVAD—for its heavy divisions and is developing the Light Air Defense System—LADS—for its light divisions. There is no program to procure these gun systems for ARNG divisions.

We believe the problem could be solved by buying product improved Vulcans (PRIVAD) and Chaparrals for the ARNG.

We recommend that the Army issue 16 of the 32 Chaparral sets being produced as a maintenance float for the Army to the eight ARNG air defense battalions and that the Congress authorize and fund in fiscal year 1983 Chaparral Test Sets to accompany the Chaparral fire units which could be provided to the ARNG in fiscal year 1984. In addition, we recommend 16 forward area alerting radar (FAAR) sets be authorized and funded in fiscal year 1983. The ARNG could then begin training with effective air defense weapons in 1983 or 1984. We would then ask the Congress to authorize and fund 48 Chaparral fire units in fiscal years 1984, 1985, 1986, and 1987.

There may be a better way of providing air defense for the eight ARNG combat divisions. If so, we will accept it. But as of today, there if no other system programmed or to our knowledge even proposed.

AIR NATIONAL GUARD

The Air National Guard is the best equipped of all of the Reserve Components, but even in the ANG serious shortages exist. In our view, full modernization and expansion of ANG units offers the most cost effective way of increasing the conventional war combat capability of the United States Air Force.

The following table displays our estimate of the requirements to fully equip and modernize the Air National Guard:

Air National Guard shortages

(Cost in fiscal year 1982 dollars—estimated)

Aircraft modernization requirements, fiscal years 1983–89, by weapon system:	*Billions*
F–15 interceptors—convert 5 F–106's and 5 F–4's by fiscal year 1989	$3.68
F–16 tactical fighter—convert four units (24 PAA)	1.08
A–10 tactical fighter—convert two units—increase PAA of all units to 24 PAA	.20
C–130 tactical airlift—convert 5	.54
C–130A units by fiscal year 1986—increase 4 units to 16 PAA	.37
HH–X rescue and recovery—convert HH–3's to HH–X	.10
KC–135 reengining—reengine ANG KC–135 fleet	2.30
Total	8.70
Support equipment shortages for wartime deployment:	*Millions*
Missile equipment	$1.70
General aircraft support	1.49
Munitions handling	7.02
F–4 support equipment	3.82
A–10 support equipment	.43
A–7 Pave penny (passive laser system)	.53
Chemical warfare and cold weather	11.50
Total	26.49
Vehicle shortages for wartime deployment: 9 different types of vehicles—995 short	17.52
Medical equipment requirement: Medical and dental X-ray equipment, X-ray processors, optometry and dental equipment	7.95
C–E. & M. requirements fiscal years 1983–87: 15 TRC–97A radios, 2 SB–3614 switchboards, 3 TSC–62 tech controls and other equipment	169.8

That is a long list of requirements and I have attached fact sheets on each of the items. Therefore, I will only address a few of the most critical shortages.

COMMUNICATIONS

ANG communications units provide 70 percent of the total Air Force combat Communications capability, but those units are either short of equipment or equipped with antiquated equipment to the degree that the cost to modernize in the time period fiscal year 1983 to 1987 is estimated to be $169.8 million. Of most immediate concern is the $7.88 million shortage of equipment in units already designated as part of the Rapid Deployment Force. In addition, equipment estimated to cost $28.8 million is needed to permit ANG communications units to modernize with Tri-Service Tactical (TRI-TAC) Communications equipment along with the active Air Force.

TACTICAL FIGHTERS

At end fiscal year 1983, the ANG will still have one tactical squadron equipped with O-2A aircraft and three squadrons equipped with the 0A37-B. These aircraft can make a marginal at best contribution to air war in Europe and should be equipped with modern aircraft.

Of the five ANG A-10A squadrons, one is equipped with 24 aircraft as are CONUS based Air Force squadrons. The remaining squadrons have only 18 aircraft each. Even with the delivery of the 20 A-10's included in the fiscal year 1982 Air Force procurement program, the four ANG squadrons will remain with only 18 aircraft. We see no reason why A-10 production should be stopped short of filling the Air Guard requirement. Studies show that increasing the aircraft authorization of the squadrons from 18 to 24 would produce an increase in combat capability of 33⅓ percent while support costs would increase only eight percent. At a time when there is such great concern about defense expenditures, we should be seeking the least expensive methods of improving combat capability and this is surely the way.

AIR DEFENSE

The venerable F-106 fighter interceptor is overdue for replacement. Studies have shown that beginning in fiscal year 1984, the weapons system will no longer be supportable for lack of parts. Then cannibalization must begin. We applaud the Air Force decision to start replacing active Air Force fighter interceptors with F-15's. We do not understand the apparent Air Force decision to equip ANG air defense squadrons with the F-16 which is not currently air defense capable, and we do not understand why modernization of the ANG units should be delayed until some distant date.

If the F-16 is equipped with AAMRAM and appropriate radars, we will, of course, accept the F-16 as a fighter interceptor, but we insist that ANG air defense interceptor units should be modernized concurrently with regular Air Force air defense interceptor units.

TACTICAL AIRLIFT

The ANG and the Air Force Reserve provide 64 percent of tactical airlift assets of the Air Force, but this force has not been modernized and the full capability of these units is not being utilized.

Five ANG tactical airlift squadrons are still equipped with C-130A aircraft and one squadron is equipped with C-130D's. (The D model is the C-130A equipped with skis for special missions.) Our fact sheet provides detailed information which, in our view, justifies continued procurement of C-130H's. Our position is buttressed by Air Force testimony which justifies a need for increased intratheater aircraft.

We strongly urge the authorization and funding of 36 additional C-130H's for the Air Force to permit 36 C-130E's to be issued to the ANG and AFRES. This action would permit the modernization of two ANG squadrons and two AFRES squadrons.

USAF C-130 squadrons are authorized 16 aircraft each. ANG squadrons are authorized only eight aircraft each. ANG squadrons have the capability to increase from eight aircraft to 16. ANG squadrons could increase their combat lift capability 100 percent with only a minimal increase in support costs. This cost effective increase in combat capability should be made possible by continued procurement of C-130H's beyond fiscal year 1983.

KC-135 REENGINING

The NGAUS fully supports the CFM-56 reengining program and urges congressional support of the Air Force program. Congressional action in fiscal year 1982 added $85 million for an alternate version of KC-135 reengining—the JT3-D. Because of the congressional action, three ANG KC-135 squadrons will be reengined in

fiscal year 1982. We urge the Congress to continue this program so as to permit the reengining of six additional ANG KC-135 squadrons.

FORWARD LOOKING INFRARED RADAR (FLIR)

ANG A-7 tactical fighter squadrons have been tasked to perform the night attack mission. However, the aircraft have not been equipped with the FLIR which is necessary for tactical fighter night attack. This is an Air Force approved modification, but because of budget limitations is not included in the procurement program.

Two ANG A-7 squadrons are included in the RFD and we urge the authorization and funding of 24 FLIR systems for these RDF units.

RECOMMENDATIONS

ARNG—We recommend that authority and funding be provided for ARNG ground equipment at an estimated cost of $777 million and for ARNG aviation equipment at an estimated cost of $342 million. Total estimated cost of recommendation is $1.18 billion. Details of this recommendation are at Tab A.

ANG—We recommend that authority and funding be provided for procurement of ANG communications equipment at an estimated cost of $36.7 million, for procurement of aircraft at an estimated cost of $2 billion, and aircraft modifications at an estimated cost of $345.7 million. Total estimated cost of this recommendation is $2.36 billion. Details of this recommendation are at Tab B.

SUMMARY

Mr. Chairman and members, we understand that our recommendations may appear to be ambitious. But other than information you may have received in the congressionally-directed "Annual Report on National Guard and Reserve Component Equipment," we know of no other firm request for equipment for the National Guard, and we are ambitious to improve the combat readiness of the Army and Air National Guard.

Mr. Chairman, we are deeply appreciative of the support this subcommittee has always provided to the National Guard, and we pledge to produce the maximum combat readiness for the resources provided.

READINESS REQUIRES ADDITIONAL EQUIPMENT PROCUREMENT FOR THE NATIONAL GUARD

The National Guard is short $12.4 billion in procurement items to meet its wartime equipment requirement.

It is incumbent upon the United States to "Provide and maintain combat-standard equipment for Guard and Reserve units in the necessary controls to identify resources."—From the 1970 Total Force Memorandum by Melvin R. Laird, Secretary of Defense.

"This has not been the case . . . The policy appears to boil down to a redistribution of less obsolete equipment and weapons systems to the National Guard as truly new systems enter the Active Army/Air Force inventory."—From the 1981-82 NGAUS Position Statement.

EQUIPMENT OUTLOOK 1982: SHORTAGES STILL PLAGUE NATONAL GUARD

As we advance into the second decade of the Total Force Policy, we can see substantial movement in the direction originally intended by its framers in 1970. There is an increased reliance on the National Guard and Reserve as elements of the Total Force. They are the initial and primary source of augmentation of the active forces. They do compose about one-half of the nation's combat power and two-thirds of its support capability. And Guard forces do represent anywhere from 40 to 50 percent of the Army and Air Force warfighting capability in the initial stages of a mobilization.

What has not moved in the direction originally proposed by the Total Force Policy framers, however, is their guidance that the United States should "provide and maintain combat-standard equipment for Guard and Reserve units in the necessary quantities . . ." In other words, the increased reliance on the National Guard has produced only limited increases in equipment. There is little, if any, direct procurement for the National Guard in Army and Air Force procurement plans, although an amendment to the 1982 DoD Authorization Act does now require an annual report from the Secretary of Defense to the Congress on the status of Guard and Reserve equipment. Perhaps the severity of the situation is best stated in an excerpt from a private study printed in the 1981-1982 NGAUS Position Statement. That

statement contends that what is needed by the Natioinal Guard "above all is modern equipment rather than hand-me downs, and equipment they can keep regardless of any sudden need to resupply an ally."

What this means in blunt language is that a large part of the United States military establishment is ill-equipped to enter any future conflict. The types and quantities of equipment which can be made available to the Guard (and Reserve) will determine their ability to fulfill their wartime missions. Most military experts predict that any equipment ordered after the beginning of a war will be delivered after it is over. Without equipment, the National Guard cannot be ready.

As the 97th Congress in its 2d Session addresses the defense budget for fiscal year 1983 and beyond, the Administration's proposal to redress the erosion of the U.S. defense base, to include its weapons systems, is confronted with congressional concern over the size of budget deficits.

Operating on the supposition that defense cuts are inevitable, members of the Congress are seeking counsel from the Defense Department and the Services on where to cut spending. While declining to identify any low priority items, defense officials are placing priority emphasis on what are termed "readiness items" in the active forces. Readiness items, for the most part, are defined as those things needed by soldiers or airmen to operate their equipment systems in training or in combat, such as ammunition, parts, petroleum oil and lubricants and training and combat support items. Defense officials are warning the Congress that cuts may also affect these readiness items, however, as the big ticket items are estimated to achieve only about $5 billion in savings in fiscal year 1983 outlays.

In the National Guard, many units operate without the necessary equipment to perform their mission or with inadequate and antiquated equipment items. Thus, the definition of readiness items is very different in the National Guard. This is not to say that the Guard does not need the typical readiness items to support what weapons it has; it does. What is does mean is that when we do not have the weapons systems first, "readiness items" become a second priority and equipment procurement becomes our primary readiness concern.

For instance, Air National Guard units equipped with the A-7 aircraft were recently tasked to perform night attack missions, missions which cannot be performed efficiently without FLIR (Forward Looking Infrared Radar) pods. By the same token, units flying FR-4 aircraft without the Tactical Electronic Reconnaissance System are crippled in advance of a mission in high intensity warfare. The list of equipment voids in both the Army and Air National Guard is long, but what they point out is that any discussion of National Guard readiness must focus on equipment.

Major General Edward R. Fry (Ret.), NGAUS President, announced his concern over these equipment shortages and their impact on Guard readiness shortly after NGAUS pegged equipping the Guard as its number one priority last year. He said that the United States has a "long-standing policy of what is, at best, benign neglect in equipping U.S. forces." In an NGAUS policy statement on the same subject, he outlined a goal plan for remedying what he deemed a severe equipment shortage in the National Guard. It included the following:

Modernization of on-hand equipment to ensure that while it is sufficient for training it is also deployable and compatible with the equipment in the hands of the active forces.

Identification of sources of modern equipment (i.e., the current "family" of the equipment item) to be made available immediately to mobilized National Guard forces, bringing them to 100 percent wartime equipment levels.

Over a period of five years, make the transition from "come-as-you-are" to "ready . . . now"!

Since the Association's designation of equipment as its number one priority, some progress has been made in remedying the shortage. But as the Deputy Assistant Secretary of Defense for Reserve Affairs, Dr. Edward J. Philbin, pointed out in congressional testimony late last year, the Guard and Reserve are still short an estimated $17 billion in equipment items.

WHERE THE NATIONAL GUARD STANDS

As Dr. Philbin pointed out, the National Guard is lacking billions of dollars of equipment needed to fulfill its wartime mission. Although the 1st Session of the 97th Congress produced a real boost to Guard readiness with equipment add-ons, the call for defense cuts in the 2d Session will make further add-ons harder to come by. Coupled with the danger that Congresional members may equate what are deemed essential readiness items by the actives to the equipment items essential for readi-

ness in the National Guard, we are faced with a very real need to make our story heard loud and clear in the 2d Session.

Until these shortages are addressed, the National Guard is not ready. The Army National Guard is lacking $3.7 billion of the wartime equipment requirement. It also lacks $83 million needed to fund vital repair part/stock shortfalls. Currently, on-hand assets meet 78 percent of the peacetime authorization and 69 percent of the wartime requirement. It is significant that even of the equipment items on hand, many are not deployable, and for many older, deployable systems, the actives are in short supply of parts. Specific Army Guard equipment shortages are addressed in the fact sheets in this report.

The Air National Guard would need another $26.5 million to bring its support equipment up to wartime requirement levels. The communications equipment shortfall for Air Guard units committed to the Rapid Deployment Force remains significant, as does the shortage of vehicles and the shortage of medical equipment. Again, many of the aircraft in the Air Guard are not considered survivable in a NATO environment and some communications equipment will not interface with the active forces or our allies.

A "blueprint" for solving these severe equipment shortages can be found in the fact sheets of this report. But without the support of the Administration, the Congress and the nation, the blueprint will not be addressed.

The National Guard Association of the United States, long dedicated to enhanced national security for the nation, has stated that "how this equipment problem is approached over the next decade will have a profound impact upon the ability of the Guard and Reserve forces to be prepared to carry out the missions which have been prescribed." In other words, the Guard and Reserve must be fully equipped to insure our nation's strong national defense.

In short, readiness items for the National Guard are not just those things needed by airmen and soldiers to support their equipment systems. What is needed far more desperately in the National Guard are those equipment systems.

[Questions with answers supplied follow:]

Questions Submitted by Senator Barry Goldwater To Be Answered for the Record

SEEK TALK

Senator Goldwater. General, the Air Force has proposed the Seek Talk system to meet their secure voice requirements for the late 1980's. What is the projected total program cost of the Seek Talk system? How does that translate into a unit cost? What is the unit cost of the interim system—Have Quick?

General Russ. The Tactical Air Forces have stated a requirement for 7,500 Seek Talk systems plus associated support equipment. The estimated cost to develop procure and install (including associated labor costs, support and test equipment) these systems is $3.6 billion in then year dollars. That estimate equates to an average then year opportunity cost of $477 thousand per unit if you divide total program cost by units procured. The Have Quick system which is designed to counter the immediate threat but not the threat beyond the mid 1980's has an average unit cost of $14 thousand.

IMPROVED SEEK TALK CAPABILITY

Senator Goldwater. Is the Air Force thoroughly convinced that the jamming threat and the improved Seek Talk capability justify such a massive investment in secure voice equipment?

General Russ. The Air Force, in conjunction with NSA and DIA, has reviewed the threat to tactical communitions. We believe that projected changes in that threat warrant an antijam system significantly more robust than Have Quick. Based on the results of a full-scale electronic warfare exercise in 1981, our tactical forces would lose between [deleted] of their mission effectiveness if forced to operate without adequate antijam voice communications. [Deleted.]

ORIGINAL ESTIMATE FOR RESEARCH AND DEVELOPMENT FOR SEEK TALK

Senator Goldwater. What was the original estimate for Research and Development for Seek Talk? What is the current Research and Development estimate? How much has been invested so far in Seek Talk?

General RUSS. The original estimate to develop the basic Seek Talk electronics was $88.9M in 1980. This estimate included approximately $3M for test support. Our current estimate to develop the basic Seek Talk electronics is $125M. In addition we estimate test support to cost an additional $22.2M. The increase in development cost over our 1980 estimate is due to a better understanding of the complexity of the 32 different installation configurations, electromagnetic compatibility with other systems and a better estimate of the full scale development effort.

Included in the RDT&E request for Seek Talk is $58.8M to develop a miniaturized configuration for man portable applications and to reduce future integration costs into fighter aircraft. The final cost element included in the RDT&E request is $275.3M for non-recurring engineering to integrate Seek Talk into the E-3A, F-16, F-15, A-10, OV-10, F-4 and various ground command and control systems. We estimate the total RDT&E program to be $481.3M of which we have invested $64.5M through fiscal year 1981.

MAINTENANCE DEPOT FOR F-100 ENGINES

Senator GOLDWATER. What plans, if any, does the Air Force have to establish a maintenance depot in Western Europe for the F-100 engines used in the F-15 and F-16 fighters?

If the Air Force has plans to establish such a depot, what time frame will be involved?

General RUSS. At this time there are no plans to establish a USAF maintenance depot in Western Europe for the F-100 engines used in the F-15 and F-16 fighters. The USAF is in the process of establishing a network of contractor facilities to repair selected engines, modules and components. Contracts presently exist for the repair of a limited number of engine components. The capability to repair complete engines and modules in Western Europe will be available by June 1983.

QUESTIONS SUBMITTED BY SENATOR JOHN W. WARNER

DUCTED ROCKET TECHNOLOGY

Senator WARNER. I have a two-part question concerning ducted rocket technology. The first question concerns the funding level of the technology base; the second is on the all important matter of getting this promising technology into our forces. Reference attached tables, what plans do the services have to sustain and support a national capability in this vitally important technology area?

Second, ducted rocket technology, I believe, has significant application in a number of advanced missile systems. Such systems clearly include the advanced AMRAAM, the Air Force's upcoming medium range air-to-air missile.

In light of the potential application of the vastly improved ducted rocket technolgy to this upcoming defense program, why has the Air Force zeroed the flight test program for ducted rocket technology—the so-called 6.3 DRPTV line item? In fiscal year 1981, for example, $6.1 million was expended. For fiscal year 1982, we authorized and appropriated $5.5 million. But, it is zero for fiscal year 1983.

A more positive way of putting this is to ask: What can we do to assure that this promising technology does not die, particularly at a time when the Soviets with their very effective SA-4 and SA-6 systems, and our allies with a number of advanced ducted rocket programs, are continuing to field this obviously cost effective technology?

General BURKE. The Air Force intends to continue a consistent funding level for ramjet technology at the exploratory development level. In fiscal year 1983, we plan to invest $6.8 million in this area and out of the $6.5 million that we go to industry, almost $4.0 million will be directed to the ramjet contractors. The Air Force is also considering a proposal to increase this funding level in fiscal year 1983 by approximately $1.0 million. Fiscal year 1984 funding for advanced development and for major ramjet demonstrations is contingent on the identification of valid requirements for systems where ramjet propulsion is needed to achieve necessary performance levels.

The ducted rocket flight demonstration was a planned 55-month effort which has experienced a number of technical, schedule and cost problems. As a result of these difficulties, the Air Force has elected to carry the program through only the ground, free-jet testing phase. Completion of the ground test phase will answer many of the technical issues involved in the program.

The Air Force does not intend to allow this ducted rocket technology to die. We are currently supporting at the exploratory level the development of a variable fuel

flow ducted rocket and it appears that the state-of-the-art has advanced to the point where this technology is feasible. The Air Force is considering a fiscal year 1984 program start for a demonstration of this capability.

JOINT SERVICES ADVANCED VERTICAL LIFT AIRCRAFT DEVELOPMENT PROGRAM

Senator WARNER. The Joint Services advanced Vertical Lift Aircraft development program is a new program designed to develop a joint multi-mission common aircraft to replace several new helicopters planned by all four services. Do you feel this is the proper approach to be taking in the development of a new aircraft?

General BURKE. We concur that joint development is the proper approach to the JVX program. Past studies have shown that such an approach is possible provided that all services participate at the program's onset. The Air Force does not normally develop new vertical lift aircraft. Due to the costs involved and the relatively small numbers required, Air Force policy has been to missionize aircraft fielded by the other services. In the case of the JVX, the costs may be too high to be borne by a single service. By participating in the initial stages of the program, the Air Force is able to project potential requirements into the basic vehicle design, avoiding the possibility of expensive retrofits at a later date.

Senator WARNER. What type of aircraft do you envision evolving from the program?

General BURKE. A technical assessment group is currently evaluating various advanced technologies to meet service mission requirements. Until this evaluation is complete and a common vehicle design has been established, we will not know the exact type of aircraft that will emerge from the program. We envision an aircraft that will be self deployable and provide substantial increases in speed, range, payload and hover capability. It is the combination of these performance parameters that makes the aircraft's potential attractive.

Senator WARNER. Would you anticipate the tilt rotor concept to be a strong competitor?

General BURKE. The tilt rotor concept is certainly a strong competitor. The purpose of the on-going technical assessment is to provide the Joint Service Management specific information to evaluate configurations and better understand the practical options which represent affordable solutions. We are also looking at conventional helicopters and other technologies such as the Advancing Blade Concept and the Tilt Duct Fan concept.

Senator WARNER. What is the total number of aircraft anticipated for future procurement by the USAF and for what missions?

General BURKE. The Air Force currently views the JVX as a possible follow-on to the Combat Helicopter Modernization Program (HH-60D) for Combat Rescue and Special Operations missions. As JVX development matures, we will evaluate potential applications ot other mission areas as well. Total numbers required have not yet been determined and would depend upon the type aircraft developed and its capability.

Senator WARNER. With concentrated effort, can an IOC of 1990 be reached?

General BURKE. Technically, an IOC of 1990 may be achievable. The program plan has not solidified at this point so it would be too risky to categorically state when the IOC can be achieved. It would probably be more prudent to expect an IOC in 1991, or 1992.

Senator WARNER. Because of a joint concept, can we expect a shortened development cycle?

General BURKE. The development cycle will probably not be shortened by virtue of being a joint effort. However, we do expect that this project can be accomplished more expediously through application of the administration's new acquisition initiatives.

Senator WARNER. Can significant cost reduction be expected with this type of joint development?

General BURKE. The cost to the government will be much less than if each service attempted to meet its own mission requirements in separate ways.

Senator WARNER. To your knowledge, is each service an active and agreeable participant in the program?

General BURKE. All services are proceeding on a positive basis with planning for the development of this major new system.

Senator WARNER. What are the funding requirements to provide for a program to meet the IOC mentioned above?

General BURKE. We are not sure yet. There have been a number of studies in the past which reflected varying cost estimates. We have just completed a tentative

Joint Requirement paper that is being used by an Army-chaired Technical Assessment group to determine where feasiblity and cost vs performance tradeoff must be made. We will be going through the process of making those tradeoffs in the late spring—early summer. We should have better cost definition by mid-summer.

QUESTIONS SUBMITTED BY SENATOR HOWARD W. CANNON

F-15'S IN FISCAL YEAR 1982 AIR-DEFENSE UNITS

Senator CANNON. General Russ, as I recall, 729 F-15s were required to support six tactical fighter wings. How have we been able to provide F-15s in fiscal year 1982 to air-defense units when F-15 procurement through fiscal year 1982 totals only 717 aircraft?

General RUSS. The urgent requirement to begin replacement of the aging F-106 justified the diversion of F-15s originally identified as tactical air assets. Because of this diversion, we were only able to equip 5½ Tactical fighter wings and two air defense squadrons with the 729 aircraft F-15 buy. Continued procurement of F-15s well beyond the original planned buy is necessary to permit further necessary air defense modernization and the build to at least six full tactical fighter wings.

FISCAL YEAR 1983 BUDGET REQUEST FOR THE F-15

Senator CANNON. General Russ, how much does the budget request for the F-15 for fiscal year 1983 contain for support equipment to establish air defense F-15 units?

General RUSS. The F-15 fiscal year 1983 Budget Request includes funding for support equipment required for strategic air defense modernization through F-15 conversion from the F-106. The peculiar support costs in the F-15 request are as follows:

[In millions of dollars]

Items	Costs	Remarks
Avionics intermediate shop (AIS)	$65.4	Supports ADTAC III and IV conversions, and ADTAC Training Squardron.
Tactical electronic warfare set (TEWS)—intermediate test equipment.	37.4	4 sets for ADTAC III, IV, V and ADTAC Training Squardron.
Priced aerospace ground equipment (AGE)	17.5	ADTAC units—3 sets.[1]
Engine AGE	8.6	ADTAC units—3 sets.
Automated ground engine test sets	2.0	ADTAC units—4 sets.
Total	130.9	

[1] Includes all contractor furnished ground equipment.

In addition, there is $14.5M for training equipment including one operational flight trainer, one cockpit procedures trainer and an egress procedures trainer. The strategic defense forces F-15 fiscal year 1983 funding request includes $1.5M for common ground support equipment.

MISSION FOR F-15E

Senator CANNON. General Russ, what is the mission for the F-15E? How many of these aircraft would be procured if the F-15E is preferred to the F-16E after the Air Force makes its selection? Would these F-15E aircraft replace F-111s in the active force, or would they replace F-4s?

General RUSS. If the F-15E were selected as our dual role fighter, its mission would be to augment both the F-111 in its specialized long-range, night, weather, attack/strike role, and the air superiority F-15 aircraft in its all environment theater air defense mission. The planned procurement of 400 dual role fighters would not be to replace the F-111, but to help replace the F-4 as it is phased out of the inventory.

EXPANSION OF THE F-15 PROCUREMENT

Senator CANNON. General Russ, what is the basis for the expansion of the F-15 procurement objective this year from 729 aircraft to 1395?

General Russ. To meet strategic defense and tactical fighter requirements until an Advanced Tactical Fighter is available, the Air Force plans to continue procurement of the F-15 through at least 1990. This continued F-16 procurement, is required to meet the force structure objective of 44 tactical fighter wings by 1990 and retire aircraft at approximately the 20 year point. The total planned buy of F-15's through 1990 is 1395 aircraft.

E-3A FOR CONTINENTAL AIR-DEFENSE MISSION

Senator Cannon. General Russ, is the E-3A also to be procured for the continental air-defense mission? How many aircraft are to be procured, and when?

General Russ. Included in the President's Strategic Decision is a planned buy of 12 additional E-3As which will support continental air defense and worldwide taskings. These aircraft are planned for procurement through the mid-80's and will increase the total buy to 46 aircraft.

F-16 FOR AIR DEFENSE

Senator Cannon. General Russ, is the F-16 also to be procured for air defense? When?

General Russ. We are currently planning to replace the five ANG F-106 squadrons with AMRAAM-equipped [deleted].

F-16 VERSUS F-106

Senator Cannon. General Russ, on a one-to-one comparison basis, would the F-16 (armed with the AMRAAM missile) represent an improvement over the currently fielded F-106 interceptor? Why?

General Russ. Yes. AMRAAM-equipped F-16s will provide a significant improvement over the current F-106 interceptors. The F-16 will possess a look-down, shoot-down capability for attacking low altitude targets which the F-106 lacks. Also, the F-16 will provide a [deleted] mile increase in combat radius. Thus, the F-16 represents a definite improvement over the F-106.

CHARACTERISTICS OF THE F-16 AND F-106 RADARS

Senator Cannon. General Russ, what are the relative characteristics of the F-16 and F-106 radars—in terms of look-down/shoot-down capability and detection range against bomber-size targets?

General Russ. The F-106 has no look-down/shoot-down capability. It can detect Backfire sized bombers at a nominal [deleted] at medium altitudes. When equipped with the AMRAAM missile, the F-16 will have both a look-down and a shoot-down capability. Comparable F-16 detection range for a Backfire sized target would be [deleted].

ADVANCE PROCUREMENT FOR PROCUREMENT OF THE F-15 IN FISCAL YEAR 1985

Senator Cannon. General Russ, the Air Force has requested advance procurement for procurement of the F-15 in fiscal year 1985—two fiscal years away. This appears to be a somewhat unusual request, since the F-15 is not a multi-year procurement program. Has the Air Force used two year advance procurement before, and if the answer is yes, what were the past dollar levels of such two year advance procurements and what programs were affected?

General Russ. The Air Force has used two year advance procurement previously. For the F-16, an fiscal year 1981 Supplemental Request increased advance procurement in fiscal year 1981 which was identified for credit against the fiscal year 1983 buy in the amount of $28 million (TY). Due to the interrelationship of th NATO and USAF E-3A procurements, two year advance procurement was used in fiscal year 1980 ($4.5M) and fiscal year 1981 ($13.5M).

These actions were described in appropriate documentation to the Congress. Advance procurement funding for the A-10 extended past one year due to program restructuring. The fiscal year 1980 funds applied $35.1M to fiscal year 1981 procurement and $11.8M to fiscal year 1982. The fiscal year 1981 advance procurement supported $20.2M in fiscal year 1982 and $27.3M in fiscal year 1983 for long lead requirements.

AVIATION WEEK ARTICLES

Senator CANNON. General Russ, in light of recent reports in Aviation Week about decreased lead times for materials, forgings and castings, why are you requesting two year advance procurement for the F-15?

General RUSS. The January 1982 Aviation Week articles noted shortened lead times resulting from recent production cutbacks by commercial airframe manufacturers. It was noted that a new and perhaps tighter supply crunch may develop in the 1983-84 time frame when a new surge in military production is expected with implementation of the B-1B program, requiring large numbers of precision titanium castings and forgings.

The F-15 procurement lead time used to formulate the fiscal year 1983 budget is shown below compared to those used to formulate past budgets.

F-15 weapon system lead time.

Fiscal year	*Months*
1979	31
1980	34
1981	40
1982	45
1983	44

The lead time presently built into the F-15 production cycle, based on funding being available on October 1 of the fiscal year, is 21 months. Use of one year advance procurement allows purchase of components with lead times of 33 months, and two year advance procurement allows purchase of components with lead times of up to 45 months.

Many components for the F-15 (landing gear, actuators, titanium forgings and components, etc.) have lead times in excess of 33 months. It is these components that require two year advance funding for the fiscal year 1985 buy. The type of long lead items requiring two year advance procurement are not unique to the F-15 program.

Major suppliers of actuators, landing gear, supports, bulkheads, spars and longerons are few in number. These same suppliers support both the military and commercial aerospace industries. Major Air Force programs that compete for these long lead items include the B-1B, MX, KC-10, C-5B, F-15 and F-16 aircraft.

In summary, while it is true that certain aircraft material lead times are decreasing, there is no significant benefit to the F-15 program. Other military and civilian aircraft requirements continue to drive our lead time requirements to a high level. Two year advance procurement funding is required to properly protect weapon systems deliveries.

ARMY/NAVY REQUEST FOR ADVANCE PROCUREMENT FOR AIRCRAFT

Senator CANNON. General Russ, to your knowledge, are the Army and Navy requesting two year advance procurement for their aircraft procurement programs? Why is the Air Force doing so?

General RUSS. Yes, the Army and Navy both have programs requiring two year advance procurement. These programs are listed below showing the Fiscal Year in which two year advance procurement funds were first requested.

System and fiscal year

	First time requested
Army:	
MLRS	1983
Blackhawk	1982
CH-47	1983
ALQ-136	1982
Navy:	
C-2	1982
A-6	1983
EA-6	1983
CH-53	1983

One year advance procurement combined with production lead time for the F-15 is 33 months. The current lead time required for production and acquisition of certain components for the F-15 is in excess of 39 months. For instance, components such as titanium forgings, landing gear and actuators are currently critical long lead requirements.

Without adequate two year advance procurement, a six month production gap could potentially result should the prime contractors not protect production long lead requirements with their own capital. F-15 production delays and increased aircraft costs would then be experienced.

ADVANCE PROCUREMENT OF 8 KC-10'S

Senator CANNON. General Russ, the Air Force has requested $261 million for advance procurement of 8 KC-10's in fiscal year 1984. Indications are that the Air Force planned to procure these aircraft on a multi-year basis, but such a multi-year procurement has not been approved as yet. Does the Air Force plan to procure KC-10's on a multi-year procurement basis in fiscal year 1984 and thereafter? Why wasn't the KC-10 program included in the list of multi-year procurement programs given to us earlier by the Secretary of Defense?

General RUSS. The Air Force does intend to procure the KC-10's on a multi-year with expanded advance buy basis starting in fiscal year 1983. The multi-year was not included earlier because the Air Force did not have sufficient time to thoroughly review all of the procurement options. We have now looked at many quantity and funding profiles and have selected a multi-year package that will save over $250 million over the profile submitted in the budget request. It is now in coordination for submittal to Congress.

AIRCRAFT MODIFICATIONS

Senator CANNON. General Russ, the Air Force request for aircraft modifications represents a 23 percent increase over the fiscal year 1982 level. As I understand it, about $1.7 billion of the $2.6 billion total is to procure equipment to enhance capabilities—rather than to correct safety-of-flight problems. Is this correct?

General RUSS. Yes, sir.

CLASS V MODIFICATIONS OF TACTICAL AND OTHER AIRCRAFT

Senator CANNON. General Russ, please provide for the record a list—in order of priority—of the Class V modifications of tactical and other aircraft (in the mission areas not related to strategic offensive or defensive aircraft) that would be deferred if the aircraft modifications account were reduced by $150 million in fiscal year 1983. Also provide, for each such deferred modification, the associated amount for spares.

General RUSS. Of the fiscal year 1983 Class V modification program of $1,688.8 million, 60 percent is for the strategic offensive and defensive forces and 40 percent for tactical and other aircraft. In the tactical area, $22.1 million relates to the initiation of new modifications in the fiscal year 1983 timeframe. The effect of a $150 million reduction in fiscal year 1983 would be to postpone the deployment of new operational capabilities designed to counter an expanding Soviet threat and meet the Air Force's expanding mission requirements, and to terminate or delay and raise the costs of various modifications already in progress. Modification of the standing tactical force must proceed if that force is to remain a realistic contender against the threat force on the battlefield. Our aircraft are remaining in service through several generations of threat weapon system improvements. Because of this, subsystems that wear out, do not perform well over time, or become excessively vulnerable to threat advances must be updated or replaced, and new subsystems to enable aircraft to respond to changes in their mission/operating environment must be acquired. Once a weapon system is fielded the aircraft modification account becomes the sole resource to fund these urgently needed improvements. A $150 million reduction in the aircraft modification account, already far too small to satisfy the backlog of requirements levied against it, will unacceptably impare our ability to modernize the operational force so it can realize its full potential for the defense of the nation. A reduction of this magnitude would require us to reexamine the mission shortfalls associated with each modification in great detail—the same level of detail as was required over several months to put the budget together within our original fiscal constraints. We would strongly recommend against any reduction in this account.

DIFFERENCES IN RESULTS BETWEEN DEVELOPMENTAL AND OPERATIONAL TESTING

Senator CANNON. General Russ, is it true that during developmental testing of the Maverick that there were 10 successes out of 12 firings? Is it also true that, during operational testing, there has been only one success out of three shots? How

do you account for the differences in results between developmental and operational testing?

General Russ. There were 10 successes out of 12 developmental test firings and one success out of three operational test shots. These failures were determined to be unrelated to test scenarios. During all unsuccessful test firings the seeker tracker performed well.

Of the four unsuccessful launches two were caused by failure of a solder splice in the hydraulic actuation system. One of these failures occurred during developmental testing and one occurred during operational testing. The second failure in developmental testing was caused by a software coding error that disabled steering for 1.4 seconds. The second unsuccessful firing during operational testing was caused by a failure in the ground test circuit of the trajectory lofting g-bias.

We determined the causes of the four launch failures, fixes were designed and test verified in all cases except for the g-bias. The g-bias fix is expected to be verified on the next launch, which is scheduled for the first week in April.

REDUCE LEVEL OF REQUEST FOR MAVERICK

Senator Cannon. General Russ, has the Air Force decided to reduce the level of its request for the Maverick for fiscal year 1983? What is the amount of this reduction? What would be the level of procurement that would equate to a minimum sustaining rate for the Maverick for fiscal year 1983?

General Russ. The Air Force has decided to reduce the level of its fiscal year 1983 Maverick production from 2560 to 1335. This is a reduction of 1225 missiles.

The minimum sustainable production rates for Maverick in fiscal year 1983 is 110 missiles per month. The production line design for minimum production would support a 150 per month rate; however, considering spare parts and rework it can be relatively efficient producing approximately 110 per month. Our initial estimate indicates $281.1M will be required to sustain production and produce 1335 missiles.

AF OTHER PROCUREMENT ACCOUNT

Senator Cannon. General Russ. The Air Force other procurement account grew by 72 percent from fiscal year 1981 to fiscal year 1982. The growth this year is only 8 percent from $5.4 billion to $5.8 billion. General Bowden, what other procurement items would the Air Force defer if the $5.8 billion request for fiscal year 1983 were decreased by 2 percent—of $117 million? Show these deferments in order of priority.

General Russ. The Other Procurement Air Force (OPAF) Appropriation experienced a real growth in constant year dollars of 59 percent from fiscal year 1981 to fiscal year 1982. The real growth from fiscal year 82 to fiscal year 83 is 2.2 percent. The fiscal year 1981 to fiscal year 1982 increase is attributed to the Administration's commitment to rearm the United States of America. Priority emphasis was placed upon rebuilding a munitions stockpile sorely in need of modernization and suffering from several years of underfunding. Our commitment to protect Southwest Asian oil resources involved substantial investment in vehicular equipment, combat communications and mobility support equipment. We have an urgent need to replace obsolete, difficult and costly to maintain command, control and communications equipment and common support equipment. Also, our vehicle fleet is over age and in need of replacement. These initiatives are all tied directly to the force structure and the worldwide commitments for defense of the free world. The fiscal year 1983 program continues those initiatives. Programs have been thoroughly reviewed for a balanced contribution to readiness, sustainability, and modernization in the corporate Air Force resource allocation process. The OPAF request represents the most prudent allocation of resources to achieve our readiness and sustainability goals. Any reduction will have a corollary impact on our ability to operate and sustain forces in worldwide contingencies. Reductions would have to be based upon minimizing the impact on readiness and sustainability and the myriad of budget activities and items in the Other Procurement Appropriation share equally in supporting readiness and sustainability.

ADVANCED CONVENTIONAL STANDOFF WEAPON

Senator Cannon. General Russ, what is the mission of the advanced conventional standoff weapon—a major new start in development for fiscal year 1983? How does this weapon differ in capability from the Medium Range Air-to-Surface Missile (MRASM)?

General Russ. The Conventional Standoff Weapon (CSW) acquisition program will provide an air-launched standoff missile for the attack of key, heavily defended sur-

face targets. CSW will provide a medium range standoff capability in the 100 mile class.

Congressional guidance contained in the Appropriations Conference Report on the fiscal year 1981 President's Amended Budget Request emphasized the need for a viable standoff strike weapon integrated with PLSS. The Air Force plans the initial version of CSW to provide that weapon.

In the PLSS application, CSW will primarily fill a defense suppression role. The flight geometry of CSW will allow it to receive in-flight guidance updates from PLSS to ensure accurate munition delivery. CSW will feature modular munition configurations so that its role can be expanded for use against a variety of targets. For example, with appropriate antiarmor munitions, we plan CSW for application with the PAVE MOVER Engagement System as part of the Assault Breaker concept for attack of second echelon armor.

The MRASM low altitude flight profiles and guidance technique are not well suited for operation with PLSS or other similar engagement systems, e.g., PAVE MOVER. These engagement systems are intended to provide near real time location and attack of movable or moving targets. Flight profiles for such targets cannot, in general, be created in advance. In addition, PLSS and PAVE MOVER are planned to provide guidance updates via data link to a weapon in flight for improved accuracy. The low altitude profile of MRASM introduces problems associated with terrain masking, multipath, and enemy jamming.

CSW would not be as effective as MRASM in the attack of deep targets. Because of the lesser CSW range, the delivery aircraft would have to penetrate defenses until within launch range to the target. Further, such targets would likely be beyond the range at which PLSS could provide effective guidance updates to CSW. Thus, additional CSW guidance complexity would be required to maintain necessary accuracy.

CSW and MRASM are complementary weapons. They will enable the tactical commander to match the standoff weapon to the mission, target, and defense environment.

SUFFICIENT FUNDING FOR MRASM

Senator CANNON. General Russ, is there sufficient funding between the Navy and the Air Force to continue development of an anti-ship variant of MRASM in fiscal year 1983? When will the anti-ship MRASM be ready for deployment?

General RUSS. We have passed this question to the Navy since it concerns Navy funding and weapons.

Senator GOLDWATER. The meeting will stand adjourned.

[Whereupon, at 11:15 a.m., the subcommittee was adjourned, subject to call of the Chair.]

DEPARTMENT OF DEFENSE AUTHORIZATION FOR APPROPRIATIONS FOR FISCAL YEAR 1983

FRIDAY, MARCH 26, 1982

U.S. SENATE,
SUBCOMMITTEE ON TACTICAL WARFARE,
COMMITTEE ON ARMED SERVICES,
Washington, D.C.

AV-8B AIRCRAFT

The subcommittee met in executive session at 8:32 a.m., pursuant to notice, in room 212, Russell Senate Office Building, Senator Barry Goldwater (chairman) presiding.

Present: Senators Goldwater and Warner.

Staff present: Francis J. Sullivan, minority staff director; L. Wayne Arny III, Robert S. Dotson, José E. Martinez, and Carl M. Smith, professional staff members; and Tamara L. Jones, staff assistant.

Also present: Dennis P. Sharon, assistant to Senator Goldwater; Buzz Hefti, assistant to Senator Warner; Frank Krebs, assistant to Senator Cannon; and Gray Armistead, assistant to Senator Byrd.

OPENING STATEMENT BY SENATOR BARRY GOLDWATER, CHAIRMAN

Senator GOLDWATER. The hearing will come to order.

This special hearing of the Tactical Warfare Subcommittee has been called to receive testimony from the Navy and the Marine Corps on the AV-8B Harrier. This program to develop and procure 336 AV-8B's will cost more than $10 billion. That is about $30 million per airplane. I am determined to insure that we enter this commitment with our eyes wide open.

I am aware that the average annual accident rate of the AV-8A is the highest of any aircraft in the Navy and Marine Corps inventory. I want to go on record now as saying that if we can't operate the AV-8B any safer than we did the AV-8A, then we are not going to buy it.

The witnesses have been asked to address the safety record of the AV-8, the cost of the airplane, its logistics problem associated with the forward deployed concept and a number of other issues which are of interest to this committee.

We welcome Vice Adm. Wesley L. McDonald, Deputy Chief of Naval Operations for Air Warfare; Vice Adm. Ernest Seymour, Commander Naval Air Systems Command; Gen. William White,

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Deputy Chief of Staff for Aviation, U.S. Marine Corps; and Col. James Orr, program manager for the AV-8B, Marine Corps.

Gentlemen, it is a pleasure to have you here. You may proceed as you wish.

STATEMENT OF LT. GEN. WILLIAM J. WHITE, USMC, DEPUTY CHIEF OF STAFF FOR AVIATION, HEADQUARTERS, U.S. MARINE CORPS

General WHITE. Thank you, sir.

We are pleased to join Admiral McDonald to discuss the AV-8B program. With the permission of the chairman, I would like to make a brief statement which covers each one of the areas you just mentioned—the safety record, the cost of the aircraft program, and the supportability of our forward deployment concept.

I have a team with me, Senator Goldwater, which I would like to introduce before I get into the statement. I will ask them to stand up as I mention their names.

I would like to introduce Brig. Gen. Clay Comfort, from Marine Headquarters. On my left is Col. Jimmy Orr, the program manager of the AV-8B, from Navair; Col. Hal Clark, program coordinator for the AV-8B, headquarters, U.S. Marine Corps; also Charles Plummer, who is with MACAir and has been the test pilot who has flown the AV-8B and A; and Major Priest, Marine test pilot from Patuxent River; Lt. Col. Chuck Geiger, who is my aviation safety coordinator, Headquarters, U.S. Marine Corps; and Maj. Terry Matkee, who is executive officer of a Harrier squadron based at the 2d Marine Aircraft Wing, Cherry Point, N.C.

AV-8A ACCIDENT RATE

First, I will discuss the AV-8A accident rate.

The AV-8A Harrier represents the first evolutionary step or prototype in the revolutionary aviation concept of tactical V/STOL aircraft. Similar in many ways to the first jet aircraft or the first helicopter, the AV-8A has successfully proven our deployment concept and has amply demonstrated the capabilities and flexibility of V/STOL on an operational scale.

The accident rate, although considered high, is less than that of other tactical aircraft at the same level of accumulated flight hours and/or sorties.

Significantly, in over 7,000 landings aboard CV's, LHA's, LPH's and other aircapable ships, there has never been a landing accident of an AV-8A, and only one Marine Corps takeoff accident in fleet operations.

Our analysis of the primary causes of AV-8A mishaps reveals the high pilot workload in the transition to and from V/STOL, and the various engine malfunctions are the chief contributors. These factors are not limitations of the concept; they are correctable conditions through redesign and retrofit, using modern technology.

Both areas have been addressed vigorously in the design of the AV-8B. Furthermore, we have a continuing program to identify and incorporate corrective action through review and revision of training management policies.

Due to fiscal constraints, we have not been totally successful in funding needed aircraft modifications such as the three-axis stabilization improvements which would have reduced AV-8A pilot workload considerably.

The engine problems which caused 12 of our mishaps have been addressed through a component improvement program jointly funded with the Royal Air Force and through intensified attention to maintenance and overhaul procedures.

Of the 12 engine-related problems, 8 have had, or have in process, corrective design improvements. Some of these improvements have already been incorporated ir operational engines and, as we will deal with later all will be incorporated in the AV-8B engine.

Three of the 12 are attributable to maintenance problems.

The one remaining cannot be fully analyzed because of inadequate information.

Because of the small total number of Pegasus engines, they did not receive priority in the funding for correction of deficiencies until 1979. Accordingly, the results of many of the corrections will not be realized until next year.

In addition 1984 OSIP—operational safety improvement program—funds for new design low-pressure fan disks and the shrouded low-pressure turbine for retrofit to the AV-8A engine are being requested.

ENGINE-RELATED MISHAPS

Four of the nine nonmaintenance-related engine mishaps are attributed to these components.

The 1981 mishap rate in particular is of major concern to us. I will deal with the 1981 history in detail.

SUMMARY OF 1981 USMC AV-8A ACCIDENTS

Date	Place	Cause	Injuries
Jan. 19, 1981	Cherry Point	Loss of control in VTO transition. Classed as pilot error	Fatal.
Jan. 25, 1981	Yuma	Evidence of incorrectly set fuel unit. Pilot judgement. Classed as pilot error.	None.
Feb. 26, 1981	Cherry Point	Engine fan disc failed on takeoff. Corrective part requested	None.
Mar. 18, 1981	Cherry Point	Loss of control in VTO transition. Classed as pilot error	None.
Apr. 20, 1981	U.S.S. Nassau	Aborted STO. Combination pilot error but primarily improper instruction from deck officer.	Minor.
Dec. 3, 1981	Twenty-nine Palms, Calif.	Aircraft flew into ground during ground attack mission. Pilot error.	Fatal.

This chart shows the dates and causes. An analysis of these Marine Corps mishaps shows five were due to pilot error and one to engine failure. The mishap in green is the engine failure. The cause will be eliminated in the AV-8B engine.

Of the pilot mishaps, the three in red can be attributed to pilot workload problems which have been corrected in the AV-8B. The remaining two in blue were pilot error in the conventional mode and were a function of flight judgment.

In short, four of the six mishaps can be at least in part attributed to factors which have been corrected in the AV-8B.

In the AV-8A, you must remember, we have an aircraft which, valuable as it has been in developing and proving our V/STOL operational concept, was basically designed 20 years ago with the aerodynamics and systems of that era.

Senator GOLDWATER. When you say loss of control, what are you referring to?

General WHITE. When I say loss of control I mean in vertical flight, where the aircraft got away from the pilot.

Senator GOLDWATER. Did most of these accidents occur in liftoff or in letdown?

General WHITE. I am not addressing the slide you see but in totality all of the accidents we have experienced. It roughly comes to one-third of these accidents that can be attributed to a material malfunction, an engine malfunction primarily. One-third can be attributed to conventional flight, nothing to do with the V/STOL mode of operation; and one-third of our accidents can be attributed to V/STOL operation, which is a vertical landing or a vertical takeoff or the transition to a vertical landing or transition from a vertical takeoff. So, it is roughly one-third conventional, one-third material and one/third attributed to V/STOL accidents.

Senator GOLDWATER. When you have a takeoff or letdown accident, is it usually an engine problem?

General WHITE. I am sorry——

Senator GOLDWATER. What else could happen on takeoff or letdown other than an engine failure?

General WHITE. This aircraft, the AV-8A Harrier, is an unforgiving aircraft if you let the aircraft get ahead of you. The controllability of the AV-8A Harrier in transition, slow flight, takes a great amount of attention on the part of the pilot and if he is not watching and lets it get out of the safe operating regime, he cannot recover.

Now, that is the AV-8A. This is a function of the lack of aerodynamic stability in the aircraft during vertical flight; it is also a function of not having automatic stabilization equipment aboard the "A" as we have in our helos.

Conversely, on the "B" both of these considerations have been designed out. The AV-8B is a more positively stable aircraft and we have sophisticated stabilization equipment to assist the pilot to get through the transition from high performance to slow flight.

AV-8B TAKEOFF MODES

Senator GOLDWATER. One more question: You use what we used to call "Thank you, ma'am" for takeoff. You have not been using verticals on the AV-8B. Don't you have a short run boost?

General WHITE. Senator, we operate this aircraft for takeoff in basically three modes: We do practice vertical takeoff like a helicopter, taking off vertically to a hover, move to forward flight and transition into high-speed operations.

We also have short takeoff procedures where we use 400, 600, 1,000 feet of takeoff roll. The aircraft can also takeoff as a normal conventional attack jet using more runway if necessary.

With the AV-8 aircraft, both A and B, you have a full range of takeoffs. You also have a full range of landings, from vertical landings to what may be considered conventional landings.

Senator GOLDWATER. What engine did you have in the AV-8A?

General WHITE. The engine in the AV-8A is a Rolls-Royce manufactured Pegasus Dash 402 engine that was developed expressly for its high thrust-to weight ratio to accommodate the vertical flight of the Harrier.

We are going to use the same basic engine in the AV-8B, but it is an improved engine, designated the Dash 406 Pegasus engine, with specific improvements that we have designed into the AV-8B.

Although we started with the same basic engine, which is a favorable cost consideration, we will have many refinements. We have made it a safer and more reliable engine.

Senator GOLDWATER. What is the thrust of the engine on the "A"?

General WHITE. I am going to let Colonel Orr fill in those details.

STATEMENT OF COL. JAMES W. ORR, USMC, PROGRAM MANAGER FOR THE AV-8B V/STOL AIRCRAFT

Colonel ORR. The basic sea-level thrust on the AV-8A engine, the Rolls-Royce 402-402 engine, is 21,500 pounds.

Senator GOLDWATER. How much?

Colonel ORR. 21,500, sir.

Senator GOLDWATER. That is increased?

Colonel ORR. No, sir. Inherent in those engine improvements is the capability to uprate the engine by some 700 or 800 pounds.

What we are choosing to do is to rate the engine, the Dash 406 engine for the B at the same 21,500 pound thrust rating and take those engine improvements out in increased engine life and reliability. We are not going to drive the engine as hard as we could.

Senator GOLDWATER. What does the aircraft weigh?

Colonel ORR. The B weighs 12,750 pounds empty.

Senator GOLDWATER. When are you going to get the 406 engine?

Colonel ORR. We are working our way from the Dash 402 to the Dash 406 engine in three steps. We have what we call a Dash 404 engine and a 404A engine in full-scale development and pilot production aircraft. We should get the 406 engine with delivery of about the 20th airplane. It is one of these things where we just can't physically have it qualified before that time.

General WHITE. If I may comment, Senator, I find it appropriate at this time to restate we are not buying the AV-8A's. The AV-8B is a new design based on the experience we have gained from an existing design.

These two aircraft are so different that we have from time to time considered changing the name of the AV-8B to disassociate it from the older aircraft. The AV-8B Harrier has been designed from the outset to be operated in its full flight regime and mission profiles at least as safely as any other modern tactical aircraft.

AIRCRAFT FLIGHT SAFETY

I can say without reservation that our efforts are, and will continue to be, directed to maximizing aircraft flight safety within the

ever-present constraints of cost, performance requirements, and program schedule.

We will continue to identify and resolve possible hazards through safety analysis and by continuing examination of our fleet experience.

As previously mentioned, our goal for the AV-8B includes the reduction of the pilot error mishaps common to the AV-8A. Test flights to date verify that we have reduced the pilot workload by better than 65 percent. This has been accomplished by improved basic aircraft design and incorporation of a dual flight envelope "stability augmentation attitude hold system", or SAAHS, as we call it.

In addition, a "Hands-On Throttle and Stick", or HOTAS, system and an automatically scheduled flap system have been incorporated.

Increased pilot visibility is provided by a bubble canopy with a single-piece windshield.

Aircraft stability is improved by a speed brake with fail-safe provisions, a powered rudder and 100 percent more control power in the V/STOL regime. Additionally, the AV-8B has a ground proximity warning system for its low-level, high-speed attack mission.

The AV-8B cockpit features enhanced displays and controls conveniently located and easy to operate. The pilot has an improved system for monitoring fuel, weapons, avionics, and engine performance, much of which is presented in his heads-up display, HUD.

PILOT WORKLOAD

The pilot's workload is further reduced by a new warning system that allows timely management of malfunctioning systems, and a retractable inflight refueling probe that does not induce the adverse yaw common to its predecessor.

We are expending time and funds in order to reduce the accident potential related to material failure. Major improvements in engine reliability and maintainability have been made with the Pegasus engine. All known AV-8 engine design deficiencies are eliminated in the AV-8B engine. This is true as well for the airframe systems.

Our work continues toward achieving highly polished, professional pilot training and operational supervision. These areas will be greatly enhanced by the modern flight simulator and the TAV-8B two-seat trainer combination.

With the AV-8B we now have a safe, reliable, and effective weapon system.

Senator GOLDWATER. Are you going to make all of these "B's" two-seater aircraft?

General WHITE. No, sir, we are going to request 24 two-place TAV-8B's which is basically the AV-8B with a second cockpit. We are requesting that aircraft to provide a training base for our pilots.

We will be transitioning a large number of conventional pilots, particularly our A-4 pilots and some A-6 pilots. We would very much like to have an IOC of 1986 for the first of these two-seaters.

The total number is 24.

Senator GOLDWATER. General, I am aware that one of the AV-8B's crashed during the test program. Was that an engine-related accident?

General WHITE. During the test program we conducted our tests on the TAV-8B. The TAV-8B was a made-over AV-8A configured, for economy reasons insofar as we could, to the new B configuration.

Yes; we did lose one of those aircraft about a year and a half ago. It was attributed to an engine igniter malfunction.

Senator GOLDWATER. It was an engine malfunction?

General WHITE. It was an engine igniter malfunction.

Senator GOLDWATER. Before you go on, you have been checking out most of your pilots in the single-seat AV-8A?

General WHITE. Sir, we have at the present time in our training squadron at Cherry Point, N.C. seven TAV-8A's. That is a two-seat version of the single-seat A, the old aircraft.

We use those seven aircraft to teach the pilots the fundamentals of V/STOL flight.

AV-8B SIMULATOR

Senator GOLDWATER. Do you have a simulator with the system?

General WHITE. We have a simulator, but it could be by no means described as a modern state-of-the-art simulator. For the AV-8B program the simulator is state of the art.

Senator GOLDWATER. Do you have a time requirement before you check the pilot out in the AV-8A?

General WHITE. The way we select pilots, Senator, is that we take the graduates of the Naval Air Training Command, the ones with above average flight grades, take the volunteers, and we select them on that basis. These are young officers who have demonstrated proficiency through their flight grades at Pensacola and Corpus Christi.

Senator GOLDWATER. Do they get any helicopter training before that?

General WHITE. They do. We started helicopter training back in the early 1970's. When we first received the AV-8A's, when we first purchased them, we did not have any two-seat trainers. To compensate for the lack of two-seat trainer V/STOL aircraft, we gave the pilots checking out in the AV-8A a number of flights in the helicopter to give him the visual clues that he would have to have when in a hover for a landing or takeoff. This was considered a worthwhile practice, so even after we received two-seat TAV-8A's, we continued using the helicopter. This may not be required with the vastly more stable TAV-8B trainers on hand.

Senator GOLDWATER. One more question before you continue:

Do you have funds in this program for the two-seat AV-8B?

General WHITE. Sir, we do not have funds in the President's budget for the two-seat TAV-8B. We attempted, in the budget formulation that went into the President's budget, to get started, but like many other things, we wanted and the Navy wants, we lacked the priority to make the funding cut.

TWO-SEAT TRAINER

We are attempting again this year in our formulation for the President's budget for 1984 to introduce a request for the two-seat trainer. Speaking of cost we need $20 million in fiscal year 1983 to get this program started. The total cost at this stage—and this is not the most precise estimate but it is the best one we have—the total development cost for this two-seat aircraft will come in at about $160 million.

I would like to make this point, through: The Marine Corps has foreseen the need for a two-seat trainer since the inception of the AV-8B and has consistently said that we are prepared to pay for such an aircraft, this two-seat aircraft, within the program.

We are not asking for any more aircraft than the 336.

To put it this way, we are prepared to trade single-seat AV-8B's for two-seaters to keep the cost within control.

Senator GOLDWATER. I don't imagine there is much difference in the flight characteristics between the two aircraft. If you trained a man in the two-seat A could he fly the B without too much trouble?

General WHITE. We have looked at that proposition long and hard. The cockpit is totally different in the AV-8B and the systems are different and much more sophisticated. The aircraft handles differently.

So, we conclude that the old two-seat A aircraft is not a good trainer for pilots transitioning into the B aircraft. Of course, there is also the logistical consideration of trying to support a small fleet of 24 unique and obsolete aircraft such as the TAU-8A.

Senator GOLDWATER. I think it would be wise if you had two-seaters.

General WHITE. I agree absolutely.

If I can go to the cost, first I would like to register that the cost of the AV-8B program has remained within 3 percent of budget after escalation.

In addressing the cost of the AV-8B it seems almost automatic that the AV-8B and the F/A-18 are compared, although they are in no way similar aircraft. The F/A-18, as we said a moment ago, weighs 23,000 pounds empty, the AV-8B 12,750 pounds. Nevertheless, we will continue the comparison pattern.

Please keep in mind as we make this comparison that we are not in any way attempting to be critical of F/A-18 costs or to in any way imply a weakening of our F/A-18 requirement. We need both the F/A-18 and the AV-8B at a timely rate for two entirely different but complementary missions. Neither aircraft can perform the other's mission.

AV-8B AND F-15 COST COMPARISON

The recent fiscal year 1983 President's budget estimates show an average total program unit cost for the AV-8B to be slightly higher than that for the F/A-18. These estimates include costs that are retroactive to the initiation of the programs.

We believe a comparison of ongoing costs—fiscal year 1983 and onward—is more meaningful for your deliberations:

In order to put the two programs in perspective, this chart shows their salient features.

	AV-8B	F-18
Start FSD	1979	1975
Start production deliveries	1984	1980
Aircraft ordered	12	158
Aircraft delivered		15
Maximum planned rate/year	[1] 60	[2] 132
Total planned for United States	336	1,366
Completion date	1989	1992-3
Remaining program—units	324	1,208

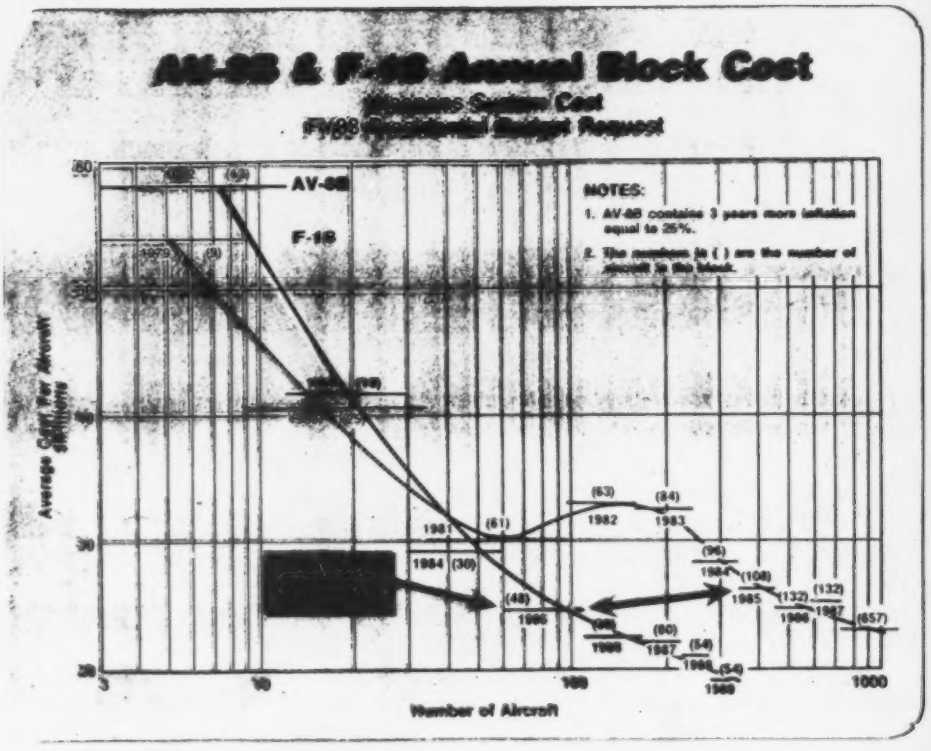
[1] 2 years.
[2] 5 years.

This chart gives the starting dates of 1979 and 1975, respectively. The start of production deliveries, 1984 for the AV-8B and 1980 for the F/A-18; aircraft delivered; maximum planned production rate—60 for 2 years for the AV-8B and 132 for 5 years for the F/A-18.

Completion dates—1989 and 1992-93—and, last, the remaining aircraft to be bought—324 AV-8B's and 1,208 F/A-18's.

You can see that the AV-8B program is roughtly one-fourth the size of the projected F/A-18 program, plus the fact that the AV-8B is 3 to 4 years behind the F/A-18, with that much more inflation built in, equivalent to at least 25 percent.

Looking forward at both programs as we plan them to unfold, we see a situation where both airplanes are essentially developed, although the AV-8B still has a short way to go; therefore, we will concern ourselves with production costs:


AV-8B & F-18 Annual Block Cost
AV-8B
F-18
NOTES:
1. AV-8B contains 3 years more inflation equal to 25%.
2. The numbers in ( ) are the number of aircraft in the block.
Average Cost Per Aircraft $Millions
Number of Aircraft
1000

This chart shows graphically the relative annual block production unit cost for the F/A-18 starting in 1979 and the AV-8B in 1982. The horizontal lines are the AV-8B and the F/A-18 annual production blocks. The left side of the chart depicts millions of dollars of cost, and across the bottom the aircraft quantity is shown.

Please note that the data on this Vugraph, taken from official congressional data sheets on both airplanes, shows that the AV-8B becomes cheaper than the F/A-18 in 1985, using the 5-year defense plan production rates. Under the original Marine Corps AV-8B requirement—the 12-24-54 buildup rate—the crossover would occur in 1984.

The effect of inflation puts the AV-8B at a higher initial unit cost but the red trend line, the curved line, shows how the AV-8B costs decrease and fall below the blue F/A-18 trend line because the learning curve outruns inflation for the smaller aircraft.

Also note that these lines indicate weapon system cost, which does not include spares. I have another chart showing these cost relationships in more detail, if it is needed.

In summary, if we look forward instead of back, and disregard those funds spent through fiscal year 1982, the AV-8B is the cheaper airplane to acquire for our light attack force.

Senator GOLDWATER. General, let me interrupt. What is the cost comparison of the two aircraft in constant dollars? I think the figure we have—I want to make sure—is the F/A-18 at 22.8 and the AV-8B at 24.5.

Colonel ORR. Yes, sir. Again, that is program cost which includes R. & D. spent to date. If we put that cost behind us and say that both airplanes are essentially developed, what we are doing is looking forward now at the cost to actually procure those airplanes off the production line and the support and spares to go with them and then operate them.

That is why we say if we take 1983 as our reference instead of the first of the program as our reference, we have put a great deal of that cost behind us.

General WHITE. How much confidence do we have in the costs leading us to this conclusion? Well, I would have to say quite high. The AV-8B, while a new airplane, is a low-risk adaptation of an existing design. We are not pushing the state of the art but, rather, incorporating proven technology into an airframe. Vectored thrust propulsion, the angle rate bombing system, composite structures, the multiplex weapon system—all have thousands of ground and flight hours on other airplanes—but we have just rolled them all into one.

Furthermore, the AV-8B program management for both the Navy and the contractor has a good track record. For example, the TAV-8B prototype program ran from 1976 to 1981, meeting or exceeding all specifications and milestones, with a cost overrun of about 2 percent. We could give a further dissertation on our high confidence level in these costs. I have people here who can do so, in response to your questions.

COMPARATIVE COST-EFFECTIVENESS REPORT

We have not addressed the last major element of lifecycle cost—operating and support costs. An extensive analysis of the "Comparative Cost Effectiveness of the AV-8B and the F/A-18 Aircraft in Support of USMC Light Attack Requirements Including Amphibious Operations," was prepared in October 1977, at the direction of then Secretary of Defense Harold Brown. The methodology of this analysis and the scenario assumptions are just as valid today as they were then except, of course, for inflation effects that apply to both aircraft equally, although the AV-8B has the advantage today that most of its development costs are behind us.

I think some of the conclusions of this report are of interest:

One, the initial procurement cost savings afforded by using the F/A-18 for the Marine light attack force is less than 3 percent.

Two, this savings is offset by the lower maintenance and operating costs of the AV-8B. The AV-8B is smaller and less complex, requires 7 percent fewer people, 50 percent of the fuel, to perform its mission and a lower value of spares because of the size and cost of the aircraft.

Three, in the close air support role, which is the primary task of the Marine light attack force, the AV-8B is likely to be more cost effective, even on a scenario-independent basis, due to its basing flexibility.

Four, the estimated relative operating cost per flight hour of the AV-8B was 73 percent of that of the F-18.

Five, annual operating costs show the AV-8B cost to be 83 percent of the F-18. Note these ratios were developed when fuel cost

was approximately 36.2 cents per gallon, compared with $1.01 today, which would increase this margin.

Six, even based on equal life cycle costs, the AV-8B is recommended for the Marine light attack squadrons.

The report also outlines other than cost considerations that underpin the recommendation:

(a) The AV-8B provides the United States and potentially other Free World forces military capabilities and options not otherwise available in the 1980's. The United Kingdom and Spain are already planning to buy the AV-8B.

(b) The AV-8B is the only option for the 1980's for substantial growth in United States V/STOL operational experience.

The cost of mobility of our light attack force, over and above aircraft cost, is three contingency support packages at $20 million each, and five independent deployable unit detachment packages at $10 million each. The cost of these equipment packages is included in the AV-8B weapon cost projection.

The cost of these support items for CTOL aircraft would be considerably higher; more runway matting, short field catapult and arresting gear, for example.

AV-8B SUPPORT COSTS

Senator GOLDWATER. Will the support cost of the B be more or less than the support cost of the A?

Colonel ORR. That is a difficult one to put in perspective, Senator. I think the best way to address it is with the hard facts that we have a pretty good handle on: The number of maintenance manhours per flight hour on the AV-8B will be something approaching 25 percent less than those numbers for the AV-8A, about 21, or almost 22 for the A, and something on the order of 16 for the B, direct maintenance manhours per flight hour.

The airplane will use about the same amount of fuel. The installed systems are more expensive than those that were in the AV-8A manual or primitive by today's standards. So, I am not sure that we can get an apples and apples comparison other than a maintenance manhour per flight hour.

Mean time between failures is increased. The time between failures increased by something like 70 percent.

Senator GOLDWATER. You really have not had enough experience to get a complete answer on that, have you?

Colonel ORR. I would find it hard, Senator. For example, the AV-8B has an onboard computer and a rather sophisticated angle rate bombing system. It has two radios. It has a dramatically improved heads-up display. It has a lot of components that were not in the AV-8. Therefore, I feel certain that it would be a more expensive airplane from the parts standpoint. However, if we compared it to any other contemporary airplane, which would be our choice, then it comes in quite well and, as a matter of fact, over the life of the AV-8B program there is an improved saving of something like $1.4 billion over the equivalent cost of an F/A-18 as the alternative, for example.

Senator GOLDWATER. Thank you.

General WHITE. Let me summarize where we stand now:

The AV-8B with its unmatched operational flexibility is still the only solution to our light attack aircraft requirement, and it is the most economical.

The AV-8B procurement program for the Marine Corps ends in 1989, compared with 1992-93 for the F/A-18, giving us a higher level of confidence in our cost predictions: The quicker the buyout, the higher the level of confidence.

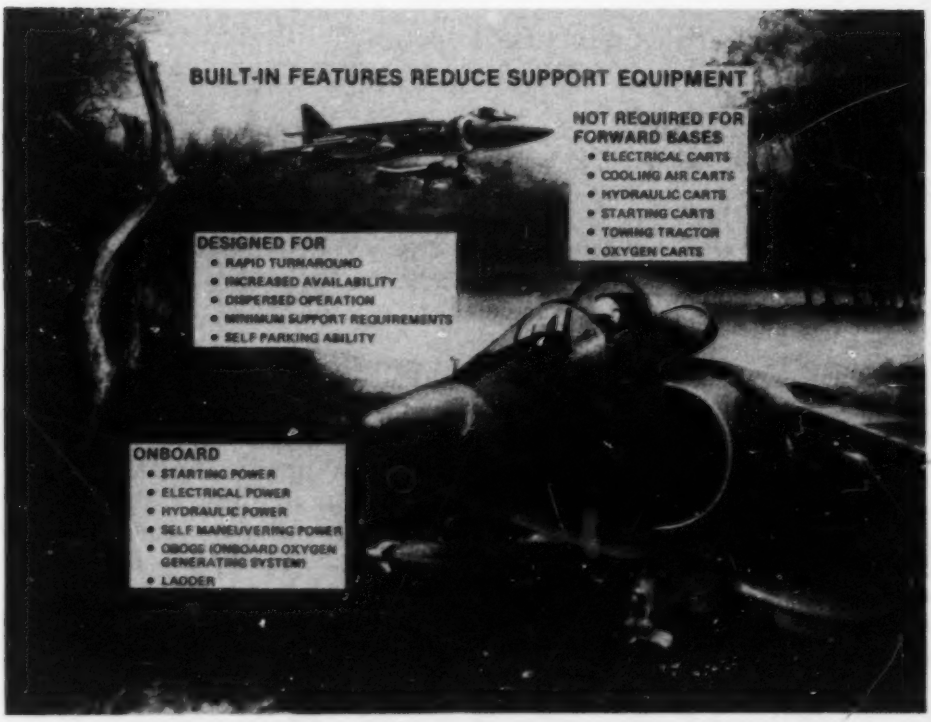
The O. & S. costs associated with the AV-8B and the cost of special mobility support packages already in the program cost projection provide a more cost effective Marine light attack force.

OPERATIONS CONCEPT AV-8B

Now, Senator, I would like to discuss the concept of operations for the AV-8B. The flexibility of this aircraft with respect to tactical mobility is unmatched by any other in the inventory. To expand this, the AV-8B can "fly in" to an amphibious objective area by making use of its more than 2,400-mile unrefueled ferry range. It can "ship in" and operate from a variety of air-capable ships until shore sites or facilities—roads or degraded runways—are uncovered; or it can fly in to ships, after the helicopter force has commenced operations, and continue to operate until sites, facilities, or bases are available ashore.

Our concept for operating the AV-8B from a variety of sites, facilities, and bases is not new. We have more than a decade of successful operations under our belts. These have been accomplished in a wide range of scenarios encompassing both sea-based and land-based operations.

The AV-8B is designed with supportability in mind and to travel light. By this I mean that the aircraft has been designed to minimize the support tail of various equipments required to operate in combat.



This chart depicts the self-sufficiency considerations that have been built into the AV-8B.

Those ground support equipment, GSE, items common to CTOL operations, such as electrical, hydraulic, starting, towing, and oxygen carts, are not required for AV-8B combat operations. This allows rapid movement ashore with flexibility for dispersal at small or remote basing facilities with minimum preparation. Further, it enhances rapid turn-around and, in turn, quicker and more sorties flown during a given period, resulting in more bombs on target and/or more targets covered.

Conceptually, forward site operations do not include maintenance, rearm, or refuel of the aircraft; however, we have the flexibility to do so should the tactical situation dictate. This is normally accomplished afloat or at the facility where the major portion of organizational-level maintenance is performed.

Higher level, intermediate, maintenance is performed afloat or at the main base.

FORWARD DEPLOYMENT CONCEPT

It is significant to note that as this concept is unfolding and during subsequent operations ashore, the AV-8B is quite supportable by helicopters and rolling stock currently in the inventory and we plan to take it along on any amphibious operation.

Senator GOLDWATER. Can I interrupt you? We went through this several years ago. The forward deployment concept of the AV-8B will require a substantial amount of logistic support. Do you have

any idea of the tonnage of fuel, ammunition, water, and support equipment you will require for each AV-8B sortie?

General WHITE. Yes, sir, I do. I will start the discussion and then I will ask for some more detailed help.

We estimate that five or six AV-8B's operating from a forward site, flying a normal number of sorties, say three sorties a day, would consume something on the order of 75 tons of fuel and ordnance.

Now, the question is, How do you resupply those forward sites?

Well, we have two options: We can take the aircraft and refuel it and rearm it, from the ship that is supporting it, or we can refuel or rearm at the main base, or, depending on the tactical situation ashore, we can use our Marine trucks and helicopters to support that forward site with that kind of tonnange.

STATEMENT OF BRIG. GEN. CLAY COMFORT, USMC, HEADQUARTERS, U.S. MARINE CORPS

General COMFORT. With respect to the logistics that we set up for operating AV-8B's, we characterize it as within our Marine Amphibious Brigade operation, and within the Brigade operation, the 40 AV-8B's that we would expect to be eventually moving ashore in that operation utilize less than 10 percent of the refueling truck support assets. Their relationship in the fuel and ordnance requirements of the Brigade is essentially no different than the other aircraft supporting a Brigade, except that the AV-8B does deliver quite a bit more ordnance on target for a given amount of fuel.

What I am trying to convey is that we have within our logistics support system the means on hand to provide the support.

Senator GOLDWATER. Thank you.

TAV-8B ENGINE MALFUNCTION

General WHITE. If I may refer back to the answer I gave on the TAV-8B accident, I said there was an engine malfunction. I would like to correct the record here.

Colonel ORR. Senator, the accident was engine related, in that the pilot was on postmaintenance check flight. On one test point, on the postmaintenance test card not associated with the developmental flight testing but, rather, with the airplane just having come out of maintenance, he was taking it to altitude and was doing a throttle slam or engine acceleration check.

The engine got into a surge or a compressor stall, a condition not unexpected in any aircraft at that area in the flight envelope, the pilot reduced the throttle to idle, as he is supposed to do; the compressor stall did not check. He shut the engine down, as he was supposed to do, then was unable to get the engine relit.

It was subsequently determined that there were several single failures in the airframe electrical power system providing electrical power to the engine igniter that could have caused the problem.

We never did isolate the problem to a specific fault; however, those entire electrical circuit and igniter system were YAV-8B peculiar to those two prototype airplanes and have been designed out of the AV-8B. The basic Pegasus engine must not be faulted for this mishap.

Senator GOLDWATER. You have had that surge problem with other B's, haven't you?

Colonel ORR. I beg your pardon.

Senator GOLDWATER. Have you had the surge problem with other B's?

Colonel ORR. We have a difficult situation right now—and this might be the time for Mr. Plummer, who was flying the airplane when it occurred, to go into this. It occurred on AV–8B flight numbers 10 and 11, a self-clearing pop at 35,000 feet.

Our subsequent examination of the engine led us to believe that it was probably a maintenance-related problem.

There are four items which Mr. Plummer can get into that we think probably could have caused that surge.

STATEMENT OF CHARLES PLUMMER, EXPERIMENTAL TEST PILOT, MACAIR

Mr. PLUMMER. The engine stalled at 35,000 feet, climbing to 35,000 in a 1-G condition at full throttle. I pulled power back and everything was fine. I came down and looked at the engine aerodynamics, since there is absolutely no reason it should have stalled that we know of. It was the same inlet, same basic engine that has been in the Y, and the Y has performed considerably better than the A model has at altitude and engine-related testing.

They said perhaps the probes on the front of the airplane might have had something to do with it. We took those off, went back to altitude, exactly the same flight conditions; it repeated.

We said, well, we don't really understand why that is. We think that it is maintenance related. We think it is part of the fuel control system.

I personally anticipate that we will go back with the airplane and find it quite easily. I don't really see any major problem there at all.

AIRCRAFT LOGISTICAL SUPPORT

General WHITE. Senator, before I finish my paper, I would like to come back to logistical support of the aircraft.

I should stress that we have now for some 10 years been practicing this concept. As a matter of fact, I was down at Cherry Point just last week and observed our Harrier squadrons operating from a forward base. I observed how they were rearmed and refueled. It is reduced to a routine; it is nothing special or spectacular.

We have learned to put a high performance tactical aircraft in the woods, so to speak, and maintain it in flight under austere and difficult circumstances.

Now, in summary, the AV–8B is a V/STOL light attack aircraft possessing performance capabilities completely unique in the Free World. These capabilities make it the only aircraft that can perform the U.S. Marine Corps light attack mission. It also possesses an unmatched self-defense capability at medium and low altitude.

AV-8B OPERATIONAL FLEXIBILITY

Its operational flexibility is an order of magnitude greater than any CTOL aircraft. This flexibility is essential to the performance of the overall U.S. Marine Corps mission.

The AV-8B can take off and land from 143 U.S. Navy ships that already have a flight deck of some sort, as opposed to CTOL aircraft which are limited to operation off the 13 present big deck U.S. aircraft carriers.

The AV-8B can be brought ashore anywhere in the world without requiring prepared airfields. It requires half the fuel of a CTOL aircraft to perform at peak efficiency.

The AV-8B can be moved ashore in less than half the time required for CTOL aircraft, thus it does not require an aircraft carrier to be committed to stay in proximity in order to provide quick response close air support for U.S. Marine Corps operations ashore.

The AV-8B can be placed close to the ground troops, enabling it to respond to the ground commander's request for air support in as little as 5 minutes, compared with 30 to 45 minutes or more for CTOL aircraft.

Although the AV-8B is just entering production, the U.S. Marine Corps V/STOL operational doctrine has been developed and proven with the AV-8A. Sufficient testing has been completed to demonstrate that the new aircraft is more than twice as effective as the AV-8A, as well as being a much easier and safer aircraft to fly.

And, finally, it is important to note that the support packages necessary to meet our deployability and mobility goals for this aircraft are included in requested AV-8B funding.

Our analysis reflects that equipment to support this concept adds approximately 1 percent to total program cost.

The payoff is real in terms of operational flexibility and responsive close air support for our Marines on the ground. In this regard, no other aircraft can measure up to the capability of the AV-8B.

Senator, that concludes my statement.

We will be happy to continue on with the discussion, at your pleasure.

Senator GOLDWATER. Thank you, General, very much.

I want to make it clear why we held this meeting. I have been a great advocate of the AV-8 ever since it came out, but we have run into this serious accident rate. I know it disturbs you as much as it does everyone else.

The Navy has established the best accident rate that we have ever had in the flying forces. The rate that you suffered has caused us to want to question you further. It is not that we intend to suspend the purchase. We just want you to know that if this accident rate continues and it does not show any abatement in the coming year, we are going to have to take a very hard, close look.

Now, we have—and that includes myself when I say "we"—a great deal of respect for the ability of the Marines to perform close ground support. I think I can probably say that you do the best job in that field of any of the services. Whether or not the F/A-18 will enhance that or not remains to be seen. I think it will.

V/STOL-TYPE AIRCRAFT DEVELOPMENT

Personally, I would like to see the day come, and come soon, when we can have you flying F/A-18's in the majority of your operations. The AV-8B, I think, is the most important. We must realize, as you do, that the United States has been terribly derelict in the development of V/STOL-type aircraft. We are probably at the bottom of the pile in that ability.

Again, I think this is something that we have to develop. We don't have anything except the new tilt rotor and the Grumman attempt at V/STOL, which we have not seen yet, and the AV-8A and B. We are going to approve what you have asked for this year, but I want you to understand that we are going to give a long, hard look at you and if you continue to have this accident rate, we will have to reevaluate. You can't stand it; your pilots can't stand it, and military aviation can't continue to put up with it.

I know that your training is as complete and as thorough as you can make it. I know that we are never going to eliminate accidents. I would like to see you get down from the high figure you are incurring to the under five that the Navy has been maintaining. I know that you want to do that.

Does the staff have any questions they would like to ask?

Thank you for coming. I hate to ask you to come over here, but your testimony is needed. We have it now. I think it is as complete as we need.

I understand that the House will probably want to add to the B buy. We will just have to see what happens when we get together.

General WHITE. Sir, thank you very much for having us over here and giving us an opportunity to talk about the AV-8B Harrier.

I assure you that the commandant and myself and everybody on our staff shares your concern with the safety record of the AV-8A. We are looking forward this year to a drastic turn-around in the accident rate.

Senator GOLDWATER. Admiral McDonald, do you have anything to say?

STATEMENT OF VICE ADM. WESLEY L. McDONALD, USN, DEPUTY CHIEF OF NAVAL OPERATIONS FOR AIR WARFARE, DEPARTMENT OF THE NAVY

Admiral MCDONALD. No, Senator Goldwater. It is a pleasure to be here, being in a sort of sitting-and-listening mode, instead of sitting where General White is.

When you speak of the Navy accident rate, it should be noted that the U.S. Marine Corps is included in all of our Department of the Navy safety statistics. The record that we feel very proud of over the last year, which we are trying to improve upon this year, reflects a tremendous amount of effort by the U.S. Marine Corps also.

Obviously, the AV-8A has statistically had a tough time. I think, that with the solutions to problems that General White had discussed here today, we will see improvement next year, sir.

Senator GOLDWATER. An interesting thing happened the other night. We often don't have a Marine as Chairman of the Joint

Chiefs. I was having dinner with a gentleman. I said, "What do you think of that?" "Well, I think it would be a good idea." I said, "Why?" He said, "It will take a Marine about 5 years to realize that there are other services."

Without objection, I will place in the record a statement submitted by Senator Hart.

[The statement of Senator Hart follows:]

PREPARED STATEMENT BY SENATOR GARY HART ON THE AV-8B PROGRAM

Mr. Chairman, I appreciate this opportunity to re-state my very strong support for the AV-8B Advanced Harrier aircraft program.

As this committee is aware, the previous Administration attempted to cancel the AV-8B program. The Congress prevented that from happening, and I had the pleasure of participating in the effort to keep the program alive. I felt at that time that the AV-8B program offered this nation some unique and very necessary capabilities—capabilities which justified the continuation of the program even when funding was very tight. I strongly believe this is still the case.

Why is the AV-8B so important? Why does it differ qualitatively from other aircraft programs, such as the F-15 or F-18? We live in a time when runways—on land or at sea—are becoming more vulnerable. Modern reconnaisance has improved the enemy's ability to find land runways, and several nations have developed ordnance which is optimized for runway destruction. At sea, our small number of large aircraft carriers faces 260 Soviet attack submarines and more than 380 Soviet naval bombers equipped with anti-ship missiles.

It is useful to remember that history has seen many air forces destroyed on the ground. From the destruction of the Polish air force in 1939 through the 1967 Arab-Israeli war, many nations have invested heavily in aircraft, only to see them reduced to scrap before they could even get into their first fight.

The AV-8B, and only the AV-8B, offers us an opportunity to reduce our dependence on long land runways and large aircraft carriers. As the RAF has demonstrated, the Harriers can operate effectively even in an intense air environment from small, dispersed bases. And our own Marine Corps has shown that Harriers can operate effectively at sea from small air-capable ships, such as our amphibious assault ships. Today, two naval air forces—the British and the Spanish—rely on Harriers to provide their sea-based naval aviation. The Indian navy has recently decided to acquire the Harrier, and other navies are seriously considering the possibility. No other aircraft in the free world, existing or under serious development, can offer this capability. If we fail to go forward with the AV-8B, we risk seeing this capability die as the existing AB-8A aircraft reach the end of their service lives, especially if Great Britain in unable to bear the full burden of future Harrier development alone.

While this V/STOL capability is the Harrier's unique attribute, it is also a very impressive aircraft in another respect: its ability to gain or lose energy quickly. As the committee is aware, energy maneuverability is an important component of an aircraft's capability in an air-to-air combat. Because of its high thrust-to-weight ratio, the Harrier can gain energy very quickly: it is one of the fastest accelerating aircraft in the world. And because of its unique thrust vectoring system, it can also lose energy quickly. Not surprisingly, it has proved very able to defend itself in the air—much more so than must attack aircraft. In discussions with my staff, one of the Air Force Red Flag aggressor pilots labelled it a "very tough opponent." Recently, the Secretary of the Navy has decided to press forward with the AV-8B+, a fighter version of the AV-8B—and an aircraft which this committee has initiated. The B+ will take full advantage of the excellent energy maneuverability of the basic airplane.

The AV-8B is thus our only opportunity to keep V/STOL alive in the decade of the 1980s, and is also an aircraft with some very impressive combat performance. I believe we need these characteristics in our tactical aviation. Accordingly, I sincerely hope the Tactical Warfare subcommittee will continue the Senate's strong support for the AV-8B program.

Senator GOLDWATER. Thank you, gentlemen. That is all we have. The subcommittee is adjourned

[Whereupon, at 9:28 a.m., the subcommittee was adjourned.]

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